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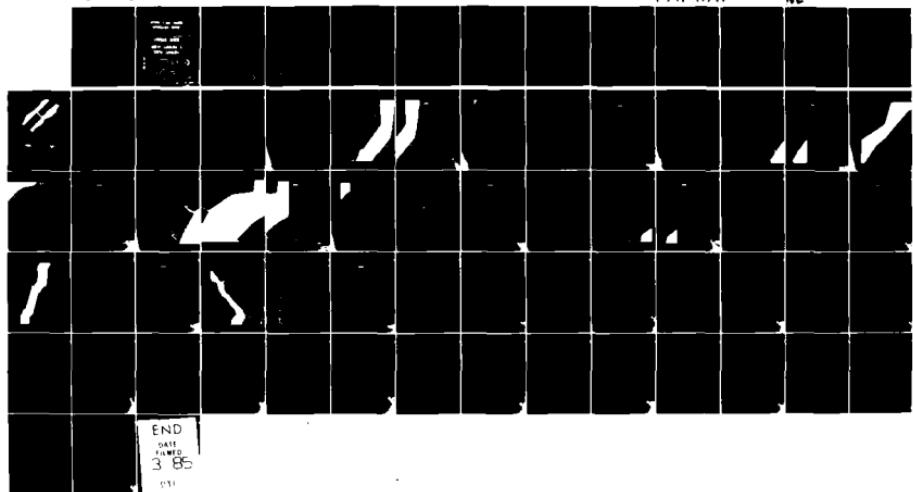
LUMBER RIVER NORTH CAROLINA & SOUTH CAROLINA SPECIAL
FLOOD HAZARD INFORMATION REPORT(U) CORPS OF ENGINEERS
CHARLESTON SC CHARLESTON DISTRICT MAR 78

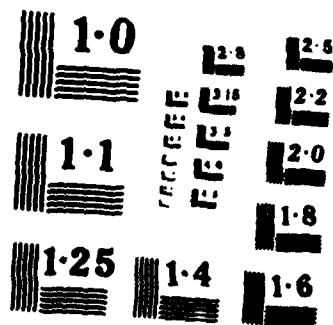
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EXHIBIT

EXHIBIT 1	
Typical Floodway Plan & Cross Section	Follows Page 6

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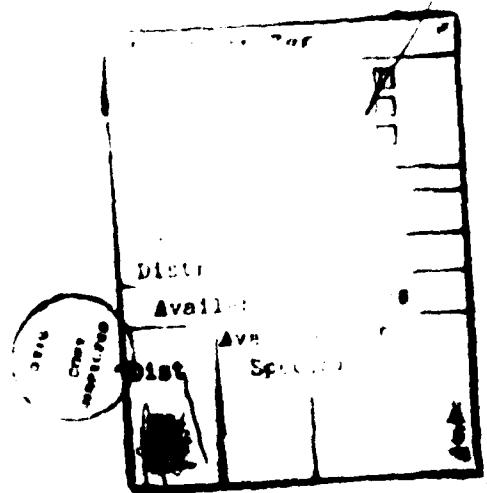
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PLATES

PLATE

- 1 General Map
- 2 Index Map - Flooded Areas
- 3-12 Flood Boundary & Floodway Maps
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Opposite Page 1
At
End
of
Report



PREFACE

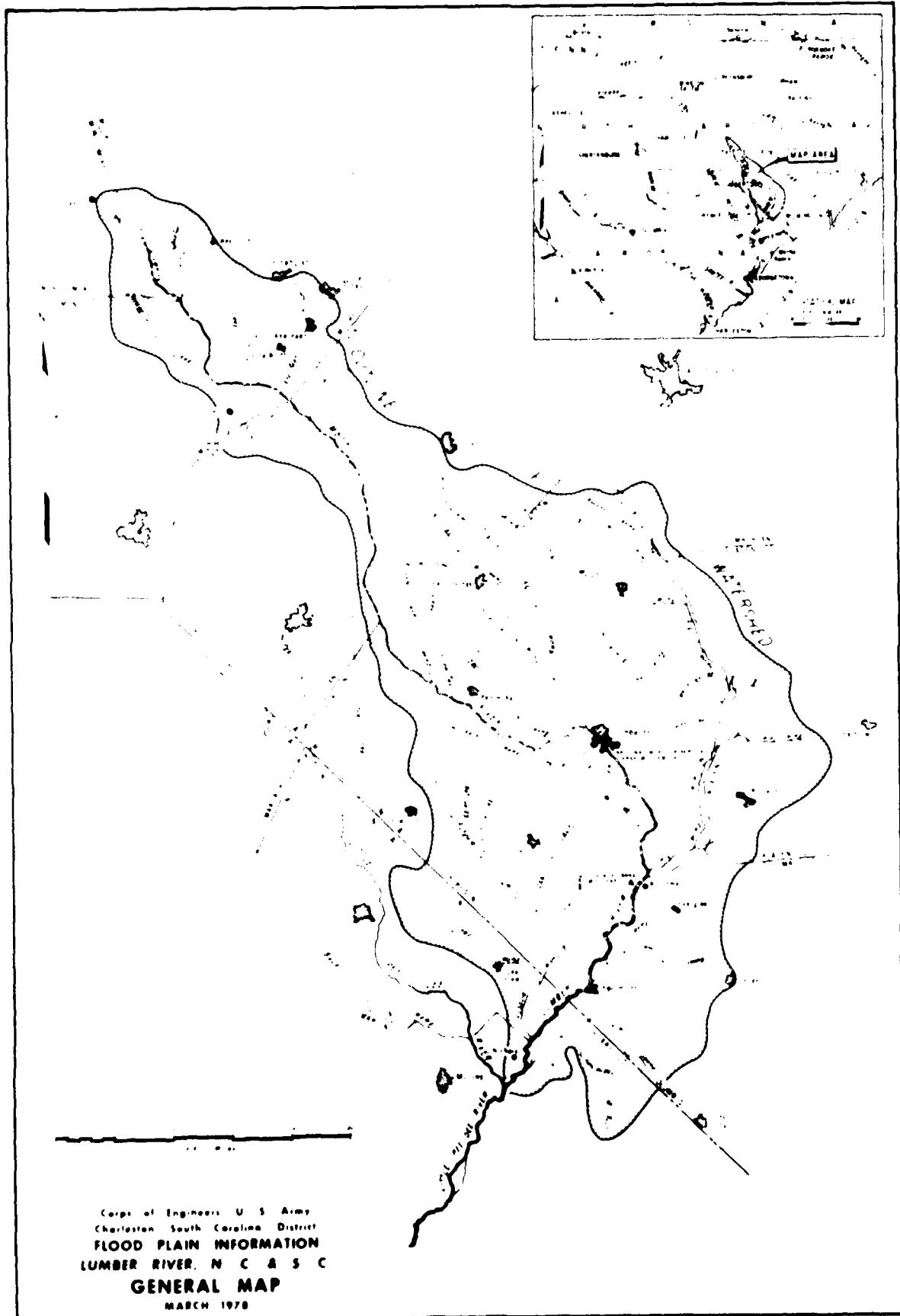
This report has been developed to fill the need for flood information at various locations along Lumber River. The study was initiated as a result of a request from the State of North Carolina for floodway mapping in the vicinities of Lumberton, Boardman and Fairbluff, North Carolina. Various other requests indicated the need for information along the entire reach of Lumber River from the mouth to the town of Lumberton. Flood information within the corporate limits of Lumberton has been developed by the Corps of Engineers under contract for the Federal Insurance Administration and will be published in a separate report. Flood information presented in this report will not conflict with data which will be presented in the Lumberton Flood Insurance Report. No other flood insurance studies have been completed or are in progress which will affect the study area covered in this report.

Although there is some urban and agricultural development in the flood plain of Lumber River in the vicinity of Lumberton, Boardman and Fairbluff, North Carolina, Nichols, South Carolina and several other small communities, most of the area subject to flooding is heavily wooded swampland. In the future, some of this land is likely to be considered for industrial sites, waste treatment facilities and other uses. Knowledge of the flooding potential is an important factor in selecting, financing and insuring various types of development.

In the past, many large floods have occurred along Lumber River, causing considerable damage at various locations. The maximum flood of record occurred during August 1928. Other notable floods occurred during September 1945, October 1964, March 1971 and April 1973. This study indicates that future floods greater than these of the past are possible.

*This report was prepared by the Corps of Engineers, Charleston District,
under continuing authority provided in Section 206 of the 1960 Flood Control
Act, as amended*

*Additional copies of this report can be obtained from the Corps of Engineers,
Charleston District, upon request. The Corps of Engineers will also provide
technical assistance in the interpretation and use of the information presented
herein*



Corps of Engineers, U. S. Army
Charleston South Carolina District
FLOOD PLAIN INFORMATION
LUMBER RIVER, N C & S C
GENERAL MAP
MARCH 1970

DESCRIPTION OF STUDY AREA

Lumber River is an interstate stream located in the upper coastal plain of southeastern North Carolina and northeastern South Carolina. The river is formed by the junction of several creeks in Moore County and Richmond County, North Carolina. It flows southeasterly to the vicinity of Boardman, North Carolina, thence southwesterly 41 miles to its mouth at Little Pee Dee River near Nichols, South Carolina. Lumber River drains an area of 1,760 square miles of which 1,616 square miles are in North Carolina and 144 square miles are in South Carolina. See Plate 1, General Map.

This report covers the 63-mile reach of Lumber River from the mouth to Lumberton, North Carolina. The flood plain along the study reach varies in width from about 1.2 mile just below Lumberton to more than 4 miles near Boardman. Most of the flood plain is wooded swampland but a considerable amount of agricultural land is subject to flooding. There are also some commercial and residential buildings located in flood plain areas in the vicinity of Lumberton, Boardman and Fairbluff, North Carolina, and Nichols, South Carolina. Some of these structures have been damaged during past floods.

FLOOD HISTORY

The greatest known flood on Lumber River occurred during September 1928. The flood resulted from a hurricane that crossed the basin a few days after the area had previously been saturated by heavy rainfall. In Nichols, South Carolina, the water rose about 11 feet above normal stage and covered some of the streets. At Lumberton, the river rose to an elevation of 117 feet above mean sea level (about four or five feet above the bank). Other significant floods on Lumber River were those of September 1945, March 1971 and April 1973. Stages and discharges for past floods are shown in Table 1.

TABLE 1
PAST FLOOD DATA ON LUMBER RIVER

Location	River Mile	September 1928		September 1945		March 1971		April 1973	
		Stage ft msl	Discharge cfs	Stage ft msl	Discharge cfs	Stage ft msl	Discharge cfs	Stage ft msl	Discharge cfs
U S Hwy 76 near Nichols S C	4 79	55 2							
N C Hwy 904 at Farbluff N C	21 16	66 5	28 500					63 7	11 300
U S G S Gage #2 1345 U S Hwy 74 Boardman N C	40 67	83 85	25 000	82 69	13 400	82 17	9 730	81 98	9 190
Carolina Light & Power Co below Lumberton N C	61 28					109 7			
S R 1620 below Lumberton N C	61 74	117 0						109 6	

Source of Information

- 1 U S Geological Survey
- 2 S C Highway Dept
- 3 Carolina Power & Light Co

FUTURE FLOODS

The main objective of this study is to furnish information which will be useful to planners and others interested in utilizing the flood plain areas along Lumber River. In order to establish flood elevation - frequency relationships, hydrological studies based on past flood data and rainfall records were conducted. The sources of data and methods of analysis are discussed in the following paragraphs.

Flood Frequency

The frequency or recurrence frequency of a flood is an expression of its rarity. Generally, large floods occur less frequently than small floods. Using records of past floods and statistical computational methods, the chance that a given flood event will be equaled or exceeded during a specified period of time can be determined. A 10 year flood can be expected to be equaled or exceeded about ten times during a 100 year period, or it has a one chance in ten of being equaled or exceeded during any year. The 100 year flood, recognized by the Federal Government and the State of North Carolina as the regulatory flood used as basis for flood insurance and land use regulations, has one chance in one hundred of being equaled or exceeded during any year.

Flood frequency determinations are based on stream flow records collected by the U.S. Geological Survey and rainfall records collected by the National Weather Service. Other important factors which are considered during determination of flood-frequency relationships include various characteristics of the drainage basin including size and shape of the basin, type of development and its location in the basin, topography, type of soil, etc.

There are several acceptable methods that can be employed in conducting a frequency analysis. In most cases, the method or methods are selected that best utilize the basic data. If reliable stream flow records are available for a long period of record, the Log Pearson Type III Method usually produces the best results. In the absence of stream gage records, good results can often be achieved by development of a rainfall runoff model (Unit Hydrograph) which relates runoff to rainfall frequency data published by the National Weather Service. In conducting the Lumber River flood frequency analysis, both the Log Pearson Type III Method and the Unit Hydrograph Method were employed. Peak discharges for 10 year, 50 year, 100 year and 500 year frequency floods were computed at several locations throughout the study reach. Computations were based on stream flow records collected by the U.S. Geological Survey on Lumber River at Boardman, N.C., river stage records collected by the National Weather Service on Lumber River at Lumberton, N.C., and rainfall frequency data published by the National Weather Service. Table 2 lists peak discharges for computed floods at various locations.

TABLE 2
FLOOD DISCHARGES
LUMBER RIVER

Location	River Mile	Drainage Area sq. miles	10 Year Flood Discharge cfs	50 Year Flood Discharge cfs	100 Year Flood Discharge cfs	500 Year Flood Discharge cfs
At mouth near Nichols, N.C.	0.00	1,760	16,100	25,000	29,800	42,000
Above Ashpole Swamp	8.40	1,565	14,500	22,500	27,000	38,100
Above S.R. 904 at Fairhuff, N.C.	21.23	1,360	12,500	19,100	24,000	34,800
at S. Hwy. 74 at Boardman, N.C.	40.67	1,220	11,300	18,000	22,000	32,000
Above Big Swamp	43.00	757	7,000	12,500	15,500	25,200
S.R. 1626 below Lumberton, N.C.	61.74	716	6,600	11,800	14,800	25,000

Flood Elevations

After establishing flood discharge-frequency relationships as discussed in the preceding paragraphs, the elevations that will be reached by floods of various frequencies are determined. The elevations that will be reached during a given flood event are dependent upon several factors including peak discharge, shape, slope and area of the stream bed and adjacent flood plain, type of cover (trees, brush, etc.) and natural or man-made features which obstruct flood flow such as bridges, culverts and dams. Field surveys are conducted to obtain the data necessary to numerically describe these factors which are used as basis for hydraulic computations. The hydraulic computations incorporate various hydraulic equations for open-channel flow, pressure flow and weir flow. The end result is a flow profile or profile for each computed flood which shows graphically the peak elevations that would be reached throughout the study area. Computed flood elevations can also be plotted in plan view on a topographic map to show the area that would be inundated by the flood. Flood profiles and flood boundary maps were prepared for the Lumber River study area, and are discussed under Presentation of Information.

FLOODWAY CONCEPT

Floodway

Encroachment of flood plains, such as artificial fill, reduces the flood carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. The concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a proposed floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood

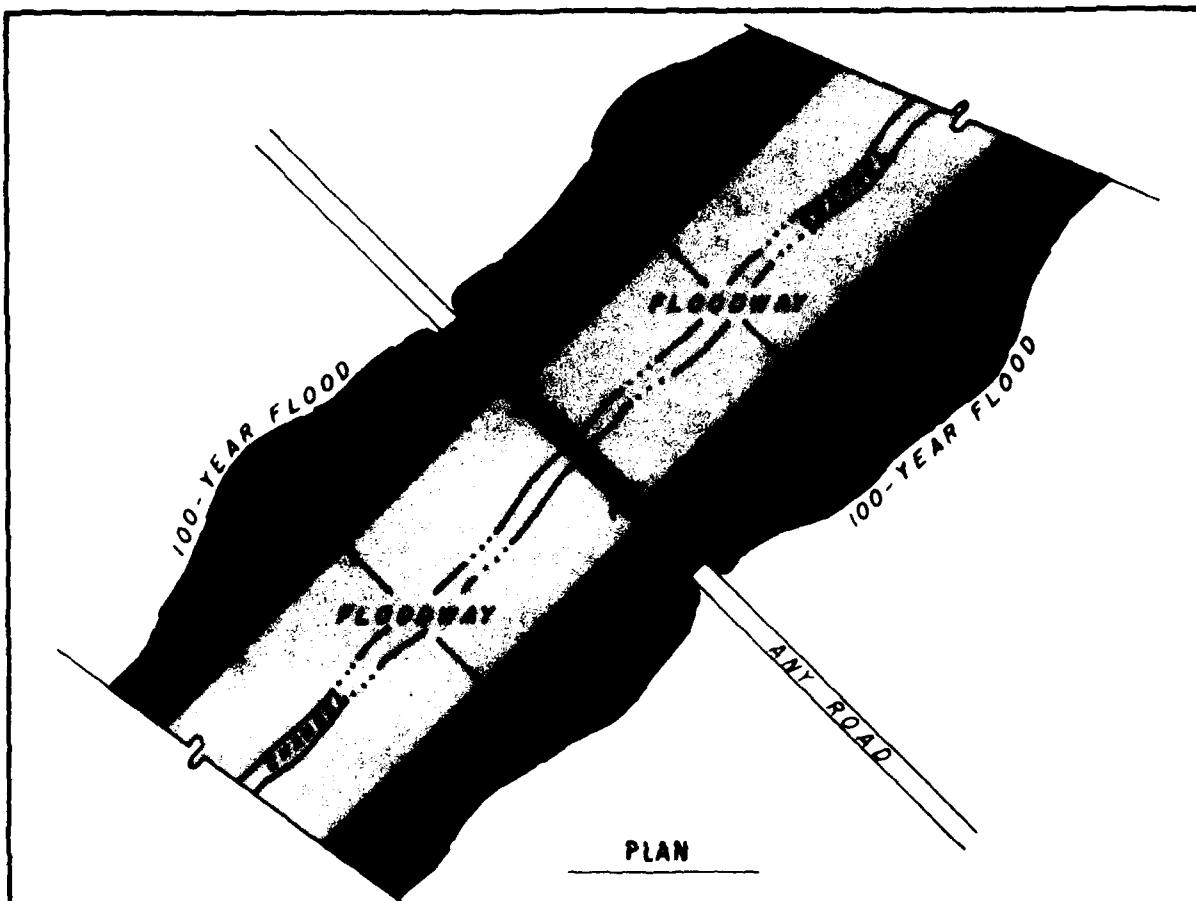
plain areas that must be kept free of encroachment in order that the 100 year flood be carried without substantial increases in flood heights. Criteria adopted by the Federal Government and the State of North Carolina limit such increases in flood heights to 10 foot, provided that hazardous velocities are not produced. The floodways in this report are proposed to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies. The floodway proposed for Lumber River was computed on the basis of equal conveyance reduction from each side of the flood plain. Floodway boundaries were determined at surveyed cross sections; between cross sections the boundaries were extrapolated.

Floodway Fringe

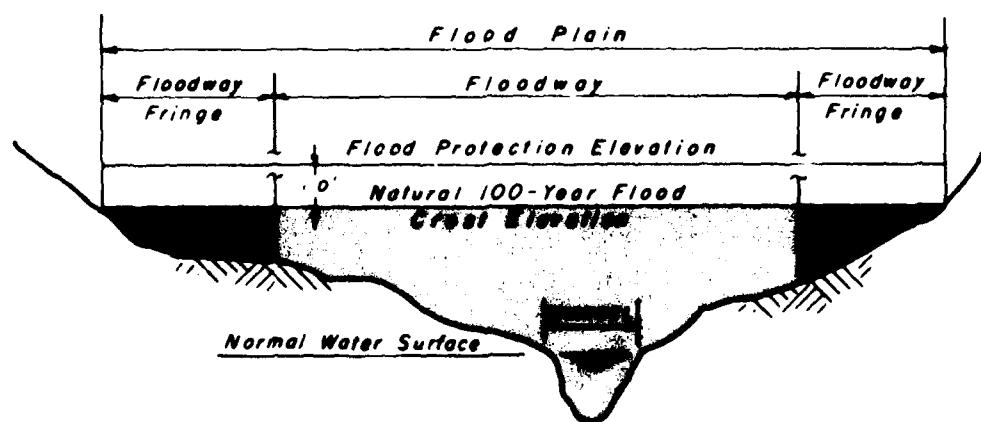
The area between the floodway and the boundary of the 100-year flood is referred to as the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water surface elevation of the 100 year flood more than one foot at any point.

Flood Protection Elevation

Complete filling of the floodway fringe area will cause the 100 year flood to rise about one foot higher than it would under present conditions. This possible future 100 year flood elevation is referred to as the "Flood Protection Elevation" which is designed to serve as a guide for development within the floodway fringe areas. Homes and other damageable facilities should be constructed above the flood protection elevation or provided equivalent protection by floodproofing. Exhibit 1 illustrates the terms described in the preceding paragraphs.



PLAN



CROSS SECTION

NOTE:

Placement of landfill in floodway fringe areas will confine 100-Year Flood to floodway and raise Natural 100-Year Flood Crest Elevation one foot to Flood Protection Elevation.

Development located in Floodway Fringe areas should be elevated above Flood Protection Elevation.

**TYPICAL FLOODWAY
PLAN & CROSS SECTION**

Not to Scale

EXHIBIT 1

PRESENTATION OF INFORMATION

Flood Boundary and Floodway Maps

Plate 2 is an index of Plates 3 through 12 "Flood Boundary and Floodway Maps", which show floodway boundaries and floodway fringe areas (defined by the limits of the 100 year flood) on Lumber River. Also shown on the maps are locations and numbers of surveyed cross sections and computed flood protection elevations. The floodway and floodway fringe boundaries were located on the maps by scaling the computed distances right and left of stream centerline. In order to locate the floodway and floodway fringe boundaries on land, it will be necessary to scale distances from boundary lines to identifiable reference marks (roads, fence lines, etc.) on the maps, then measure the same distances in the field. The actual limits of the 100 year flood may vary somewhat from that shown on the map because the scale and contour interval of the maps do not permit precise plotting of the flood data.

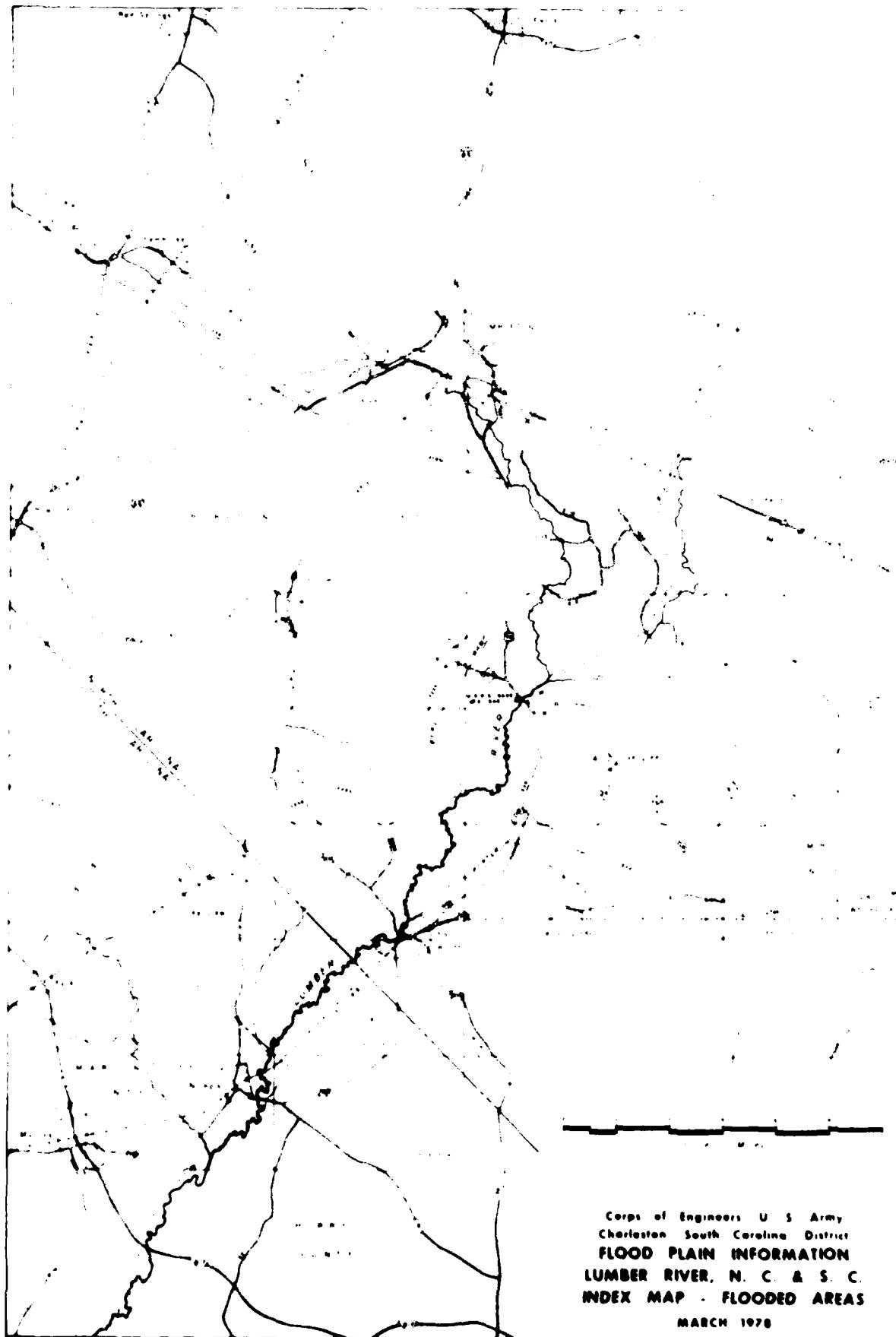
The floodway was calculated based on existing hydraulic conditions only. The method of calculating the floodway removes an equal amount of conveyance from each side of the channel. Therefore, from a hydraulic standpoint, the floodway area on either side of the stream is in proportion to the flooding potential that now exists on its respective side of the stream.

It is realized that the floodway may have to be shifted from one side to the other, depending upon political, policy or other decisions. Also, public and private plans for development and conservation may influence the desirability of the floodway location. If such policies and plans dictate a shifting of the floodway, it will be necessary to recompute the floodway based on these decisions and the hydraulic considerations.

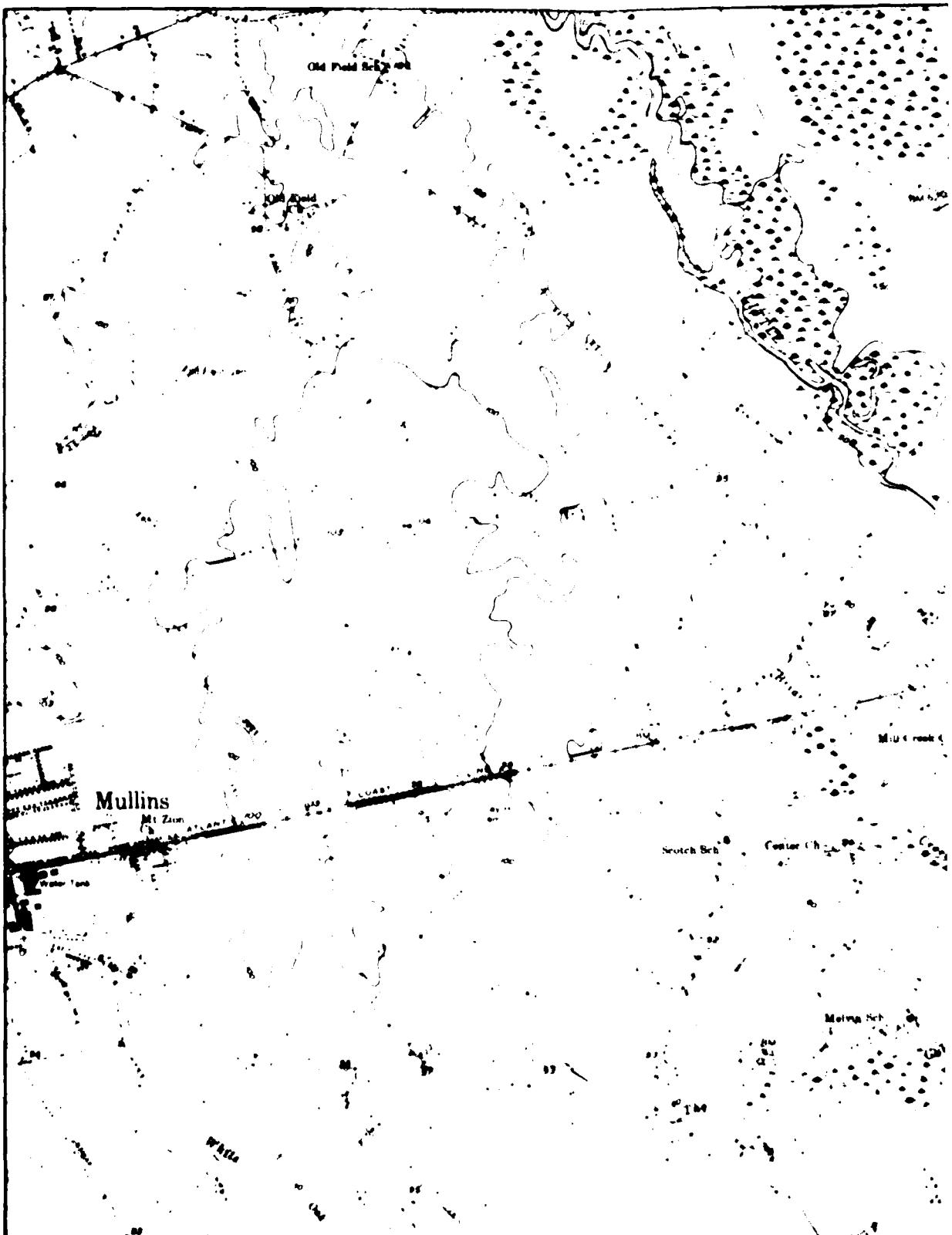
High Water Profiles

As mentioned in the previous paragraph, the limits of the 100-year flood, which delineate the floodway fringe area, are shown on the Flood Boundary and Floodway Maps. Plates 13 through 24 "High Water Profiles", show the profiles of 10-year, 50-year, 100-year and 500-year floods along Lumber River. Other information shown on the profiles includes stream bed elevations, locations of cross sections, and locations and elevations of bridges and culverts

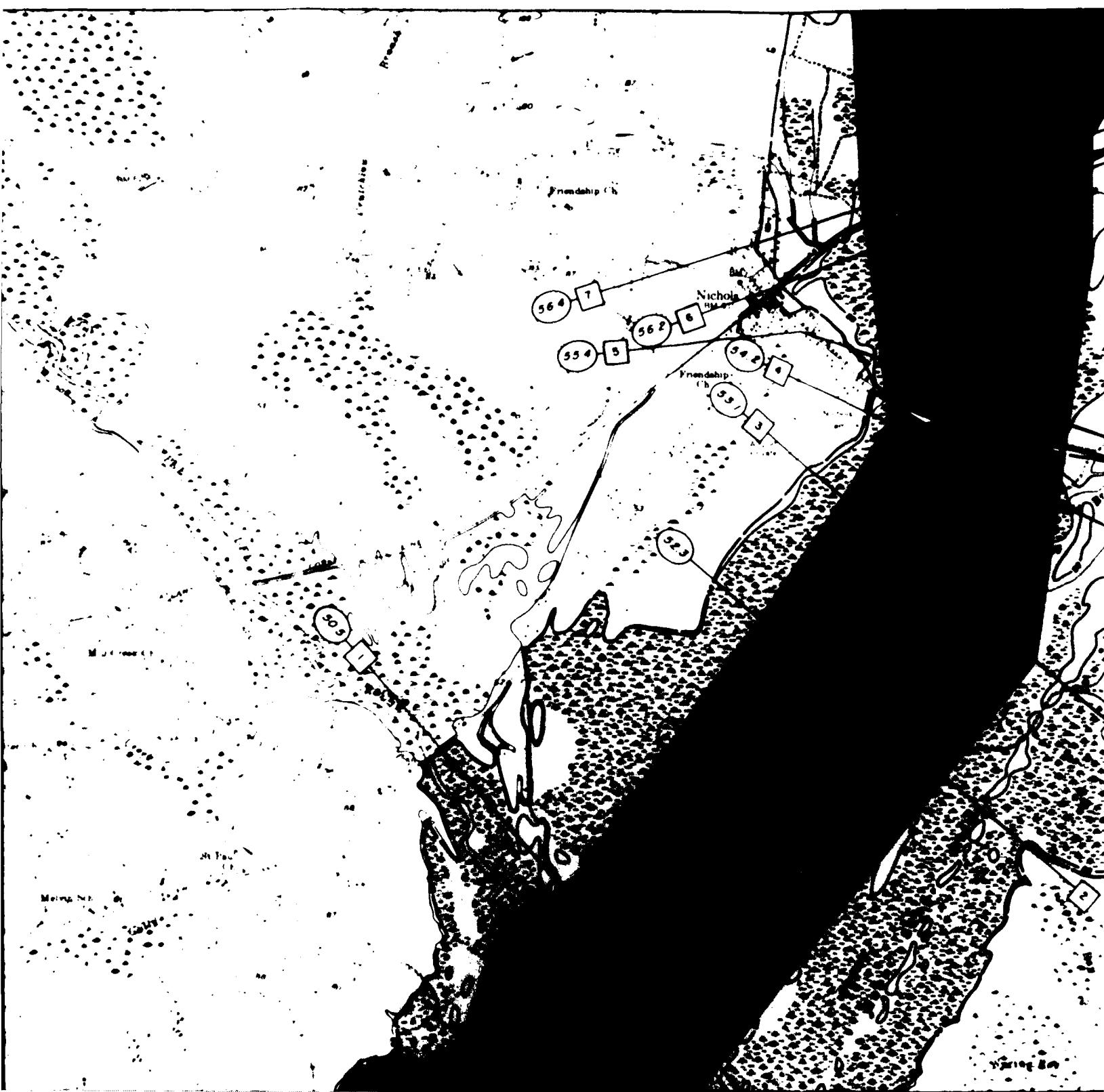
When using the Flood Profiles to determine flood elevations at a property site, first find the site on one of the Flood Boundary & Floodway Maps. Using the map scale, measure the distance, along the river channel, from the site to a reference point such as a bridge, cross section, mouth of a tributary stream or a river mile indicator. Next, find the reference point on the profile and measure the distance to the site along the horizontal scale of the profile. The horizontal scale is graduated in both thousands of feet and miles above the river mouth. The vertical scale is graduated in feet above mean sea level, datum of 1929



Map



Match Line Plate 5





Match Line Plate 4

- LEGEND -

100-YEAR FLOOD
FLOODWAY BOUNDARY

M+2 RIVER MILES

55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL

5 CROSS SECTION

- NOTES -

- 1 BASE MAP FURNISHED BY U S GEOLOGICAL SURVEY, WASHINGTON, D C
- 2 LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT
- 3 AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
- 4 FLOODWAY BOUNDARIES APPLY TO LUMBER RIVER ONLY FLOODWAY LIMITS WERE NOT DETERMINED FOR TRIBUTARIES
- 5 WHERE FLOODWAY BOUNDARIES MERGE WITH 100 YEAR FLOOD LIMITS, THE 100 YEAR FLOOD LIMIT BECOMES THE FLOODWAY BOUNDARY
- 6 CONTOUR INTERVAL IS 10 FEET



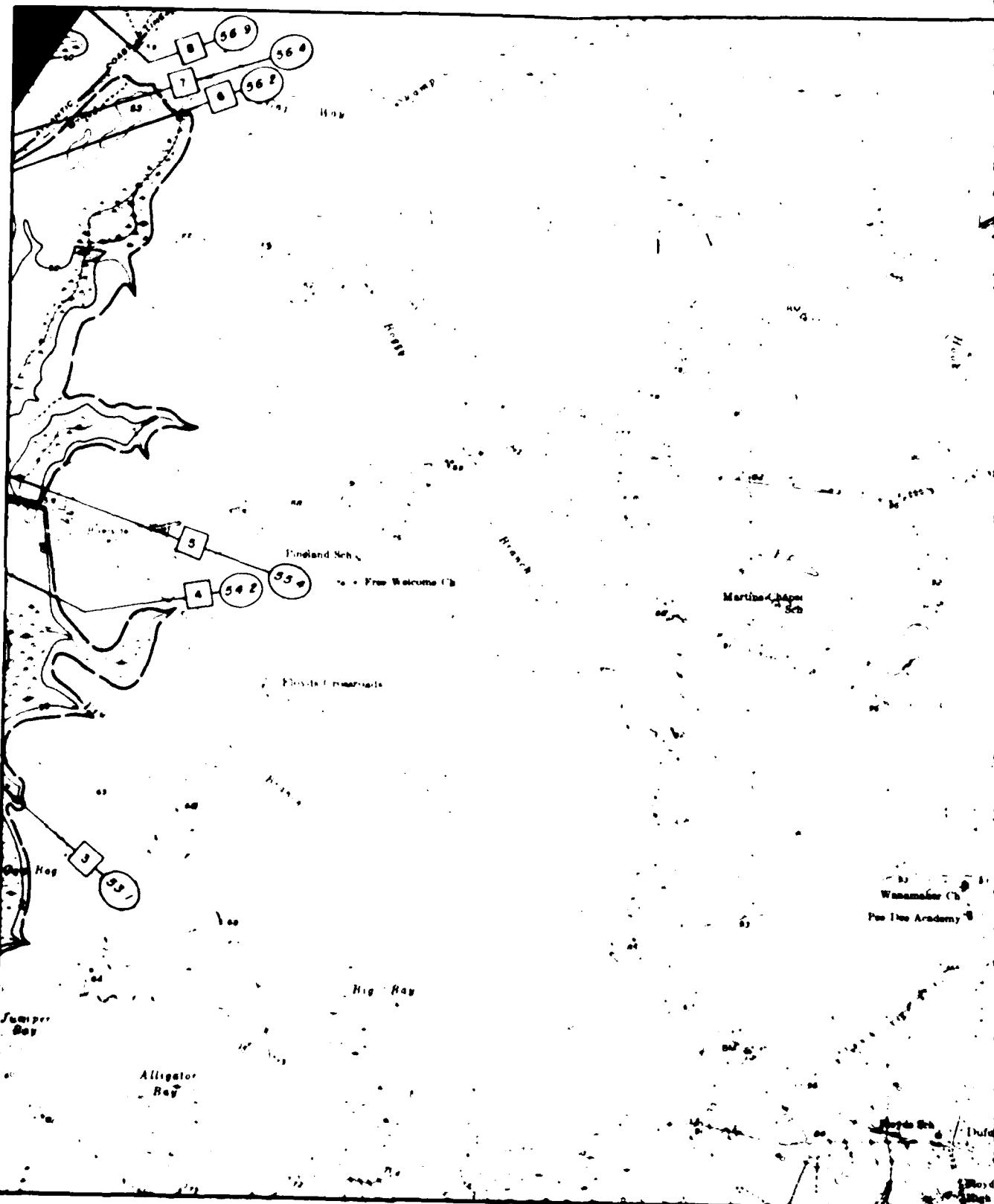
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**FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAPS**

MARCH 1978

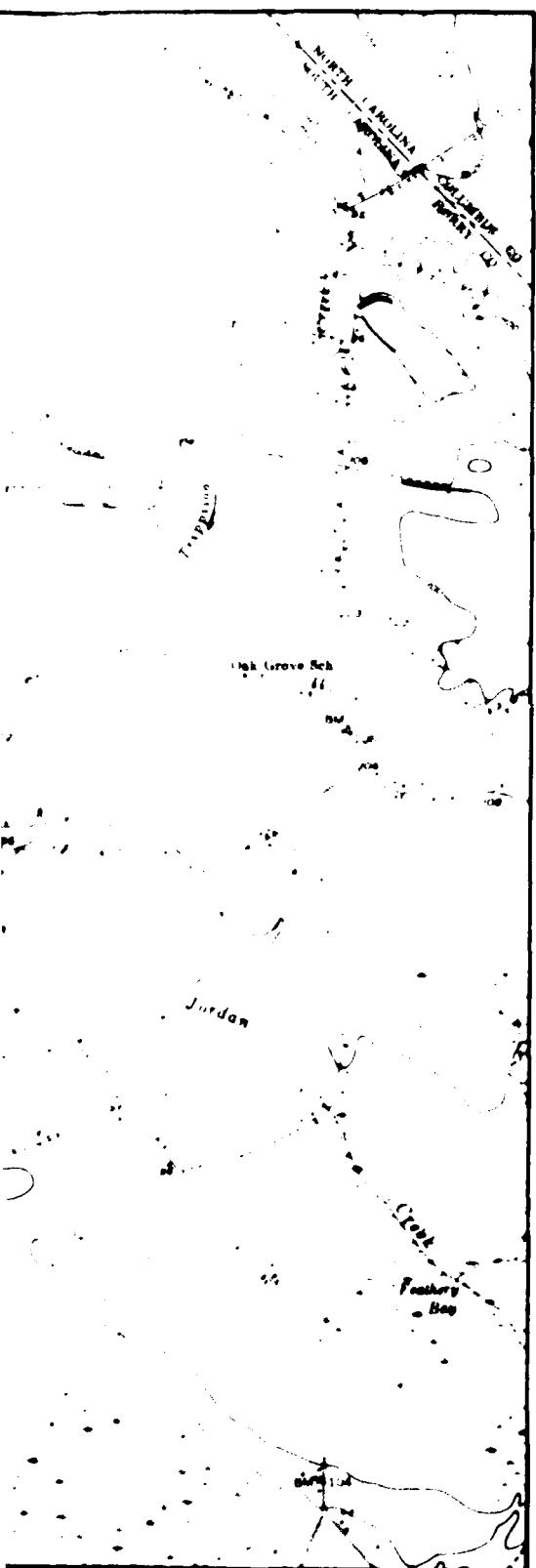
Match Line

Match Line Plate 3



Match Line Plate 8





- LEGEND -

100-YEAR FLOOD

FLOODWAY BOUNDARY

M+2 RIVER MILES

55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL

5 CROSS SECTION

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- 6 CONTOUR INTERVAL IS 10 FEET.

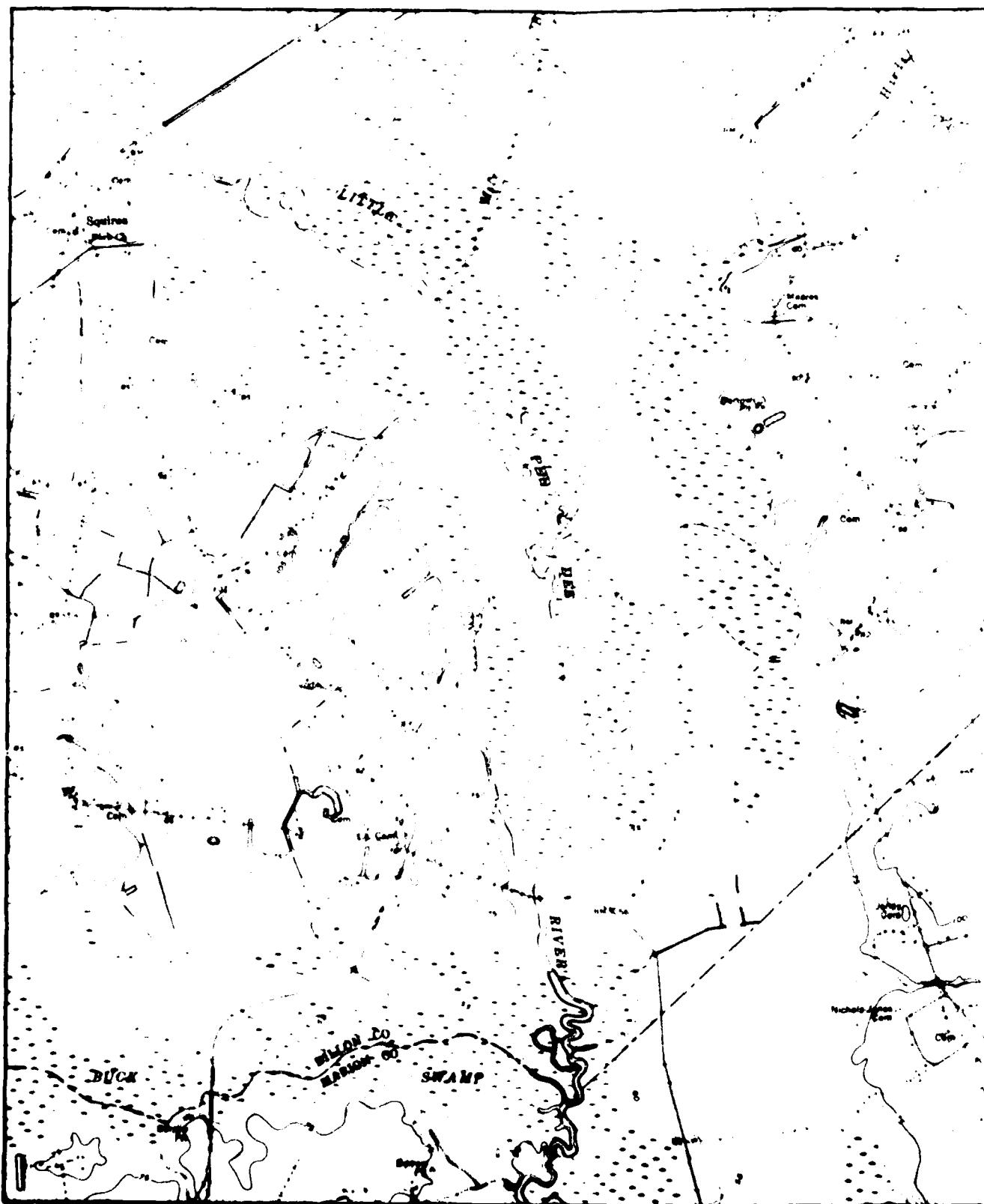


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**FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAP**

MARCH 1978

PLATE 4



Match Line



Match Line Plate 3



Match Line 6

- LEGEND -

 100-YEAR FLOOD
 FLOODWAY BOUNDARY

M+2 RIVER MILES

 55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL

 5 CROSS SECTION

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- 5 WHERE FLOODWAY BOUNDARIES MERGE WITH 100 YEAR FLOOD LIMITS, THE 100-YEAR FLOOD LIMIT BECOMES THE FLOODWAY BOUNDARY
- 6 CONTOUR INTERVAL IS 5 FEET

2500 0 2500 5000 7500
SCALE IN FEET

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FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAPS

MARCH 1978



Match Line Plate 7



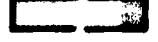
Match Line Plate 4

2



Match Line Plate 8

- LEGEND -

 100-YEAR FLOOD
 FLOODWAY BOUNDARY

M+2 RIVER MILES

55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL

5 CROSS SECTION

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FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAP

MARCH 1978

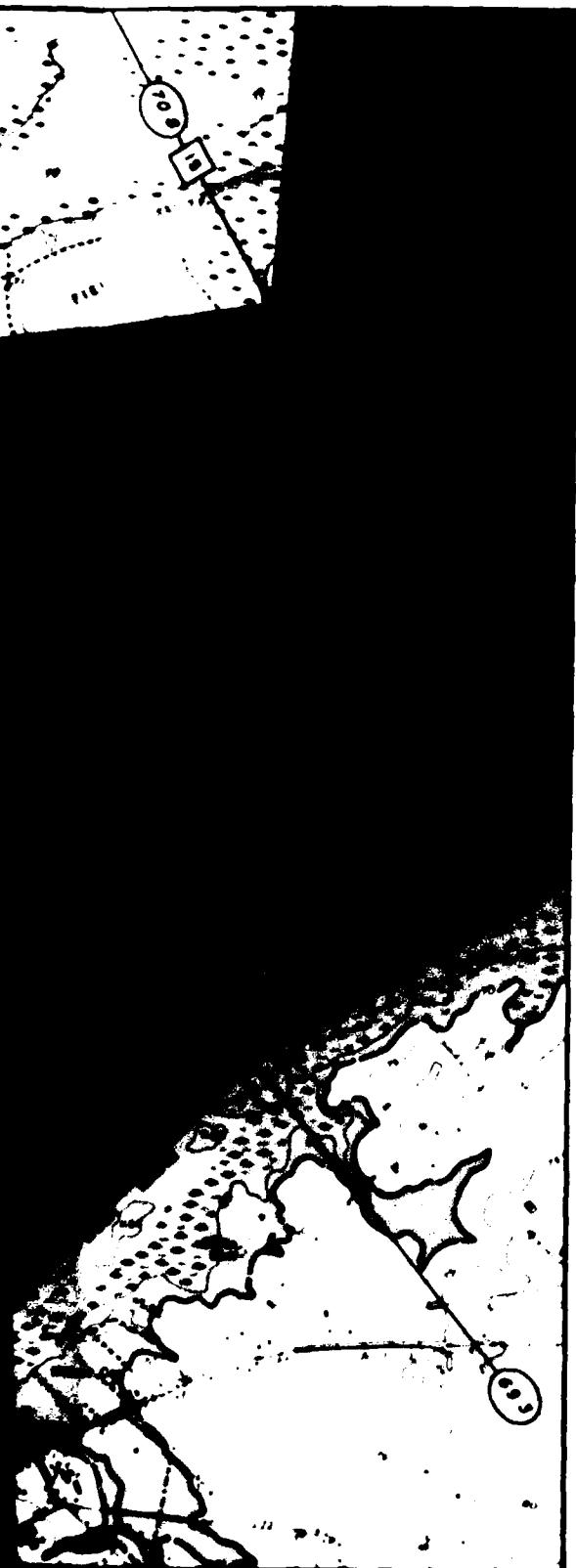
PLATE



Match Line Plate 9



Match Line Plate 8



Match Line Plate 8

- LEGEND -

100-YEAR FLOOD

FLOODWAY BOUNDARY

M+2 RIVER MILES

55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL

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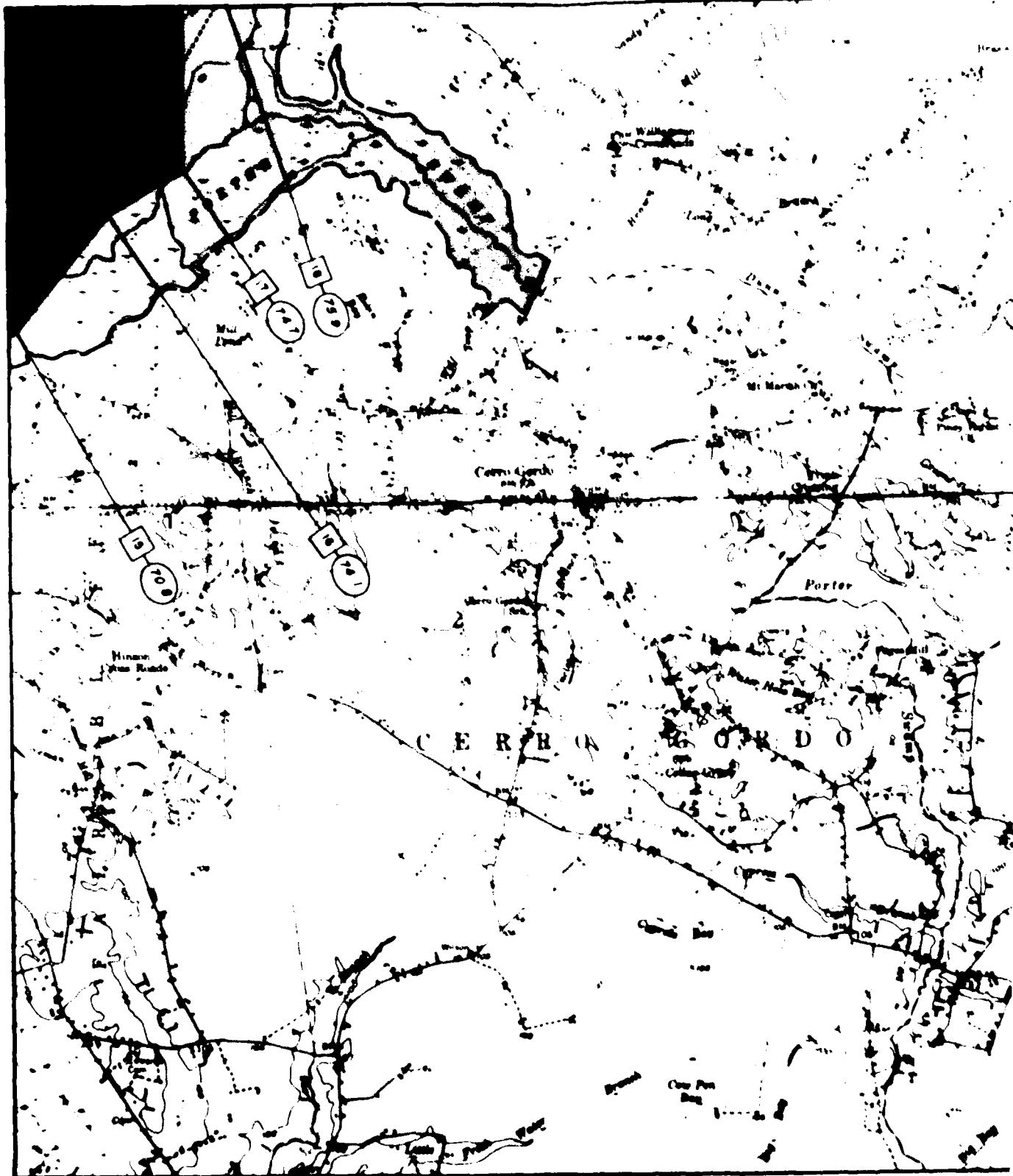
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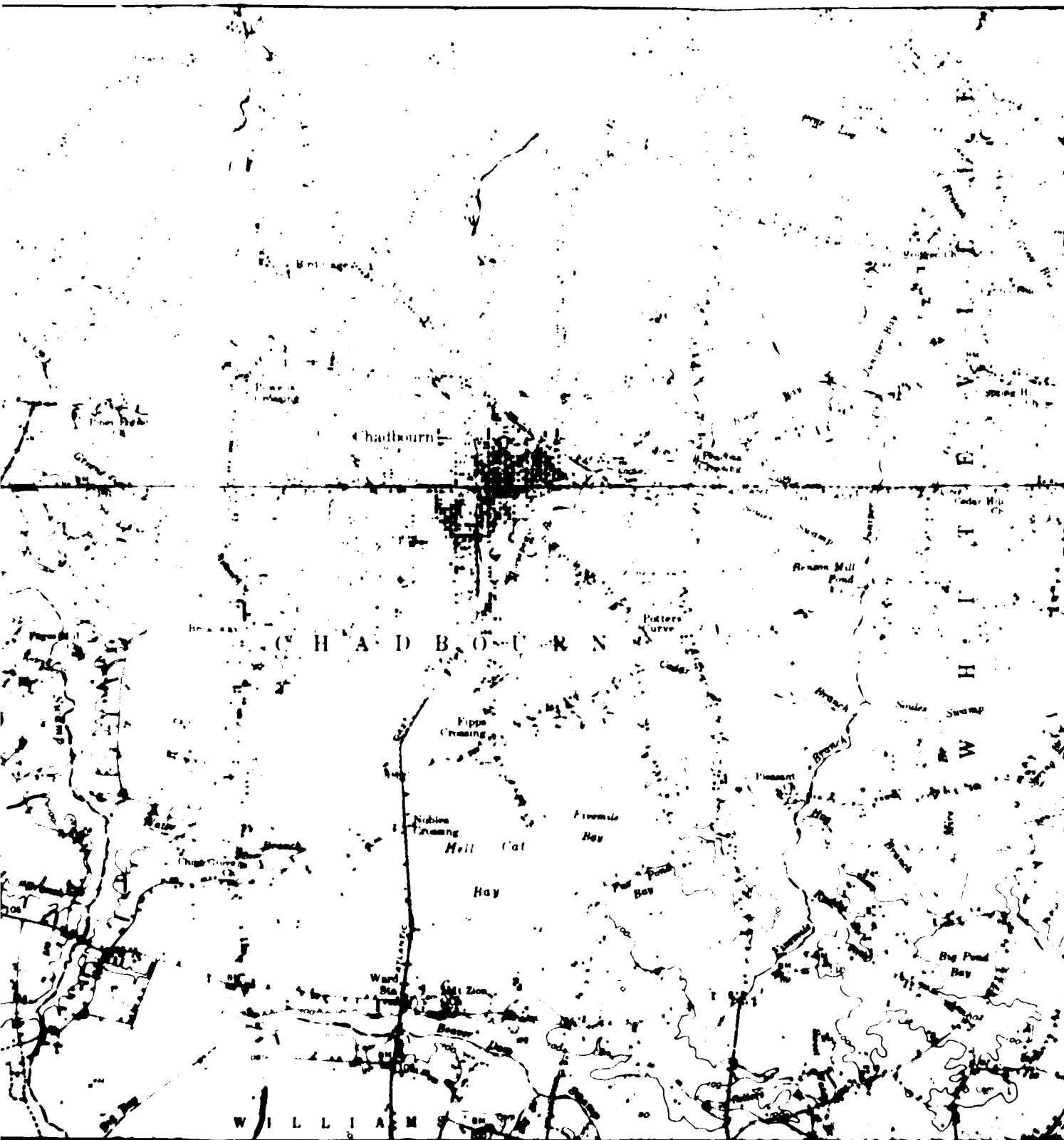
FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAP

MARCH 1978

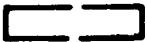
Match Line Plate 7

Match Line P





- LEGEND -

 100-YEAR FLOOD

 FLOODWAY BOUNDARY

M+2 RIVER MILES

**55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL**

5 CROSS SECTION

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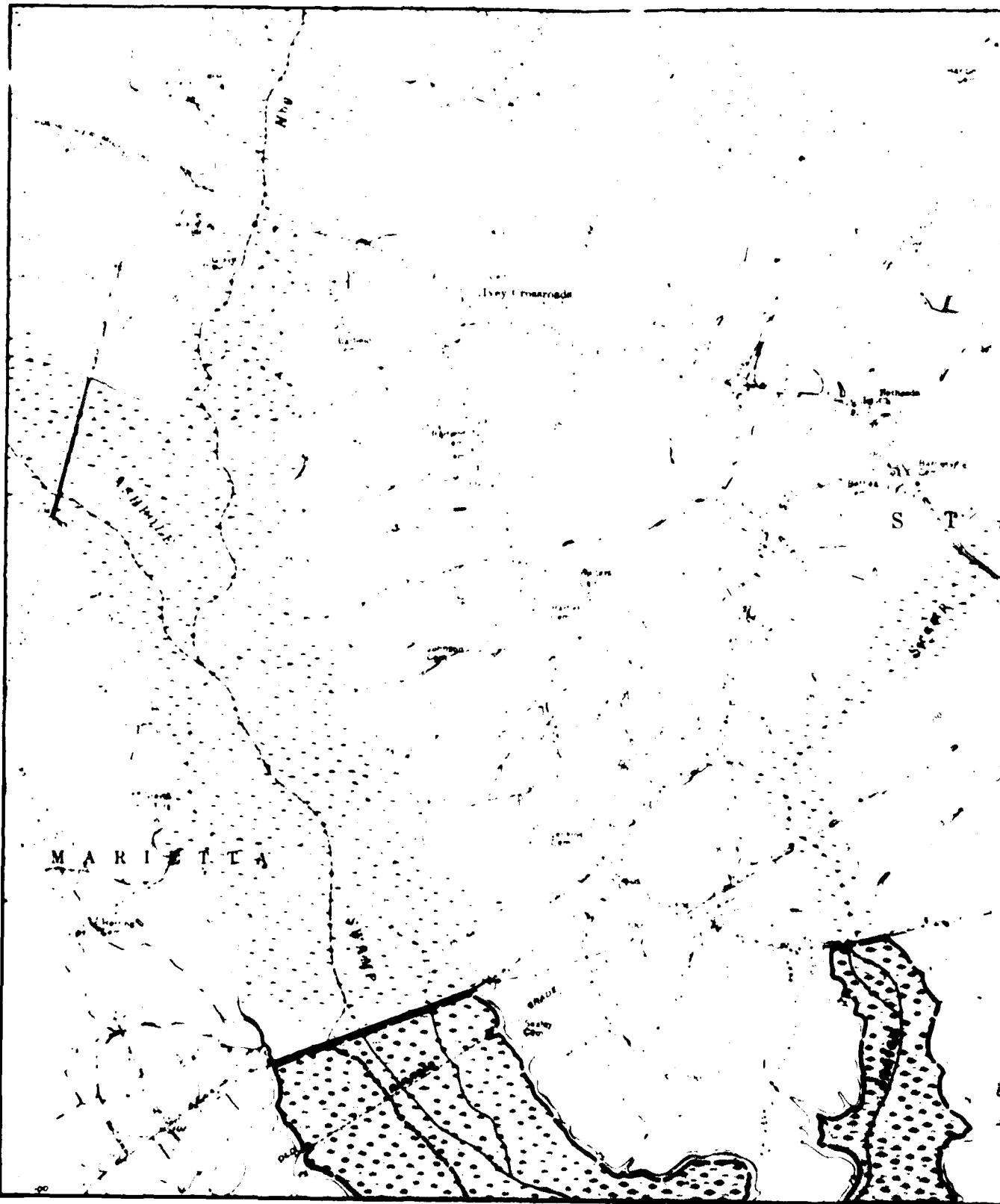
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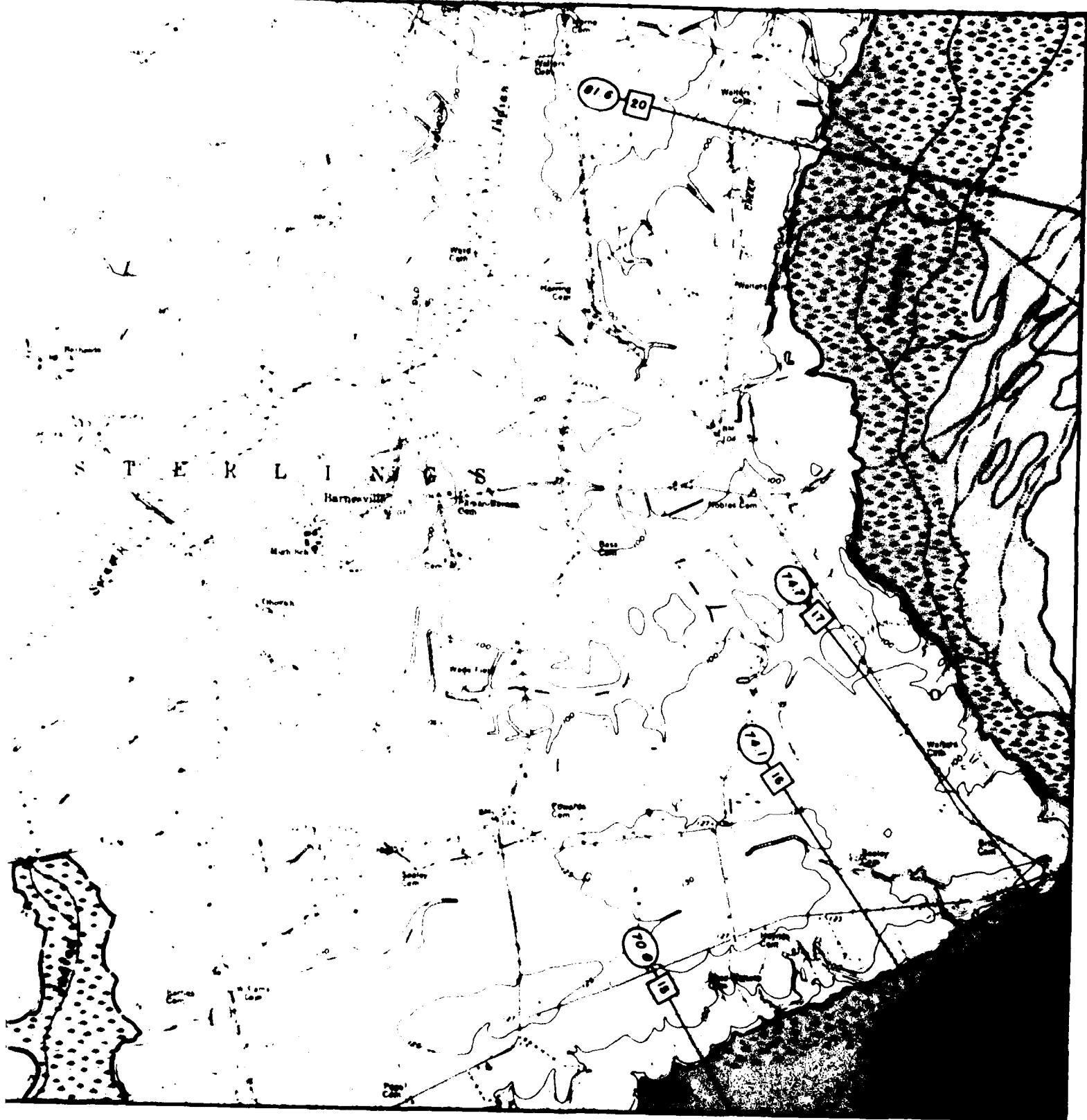
PLATE 8

Match Line



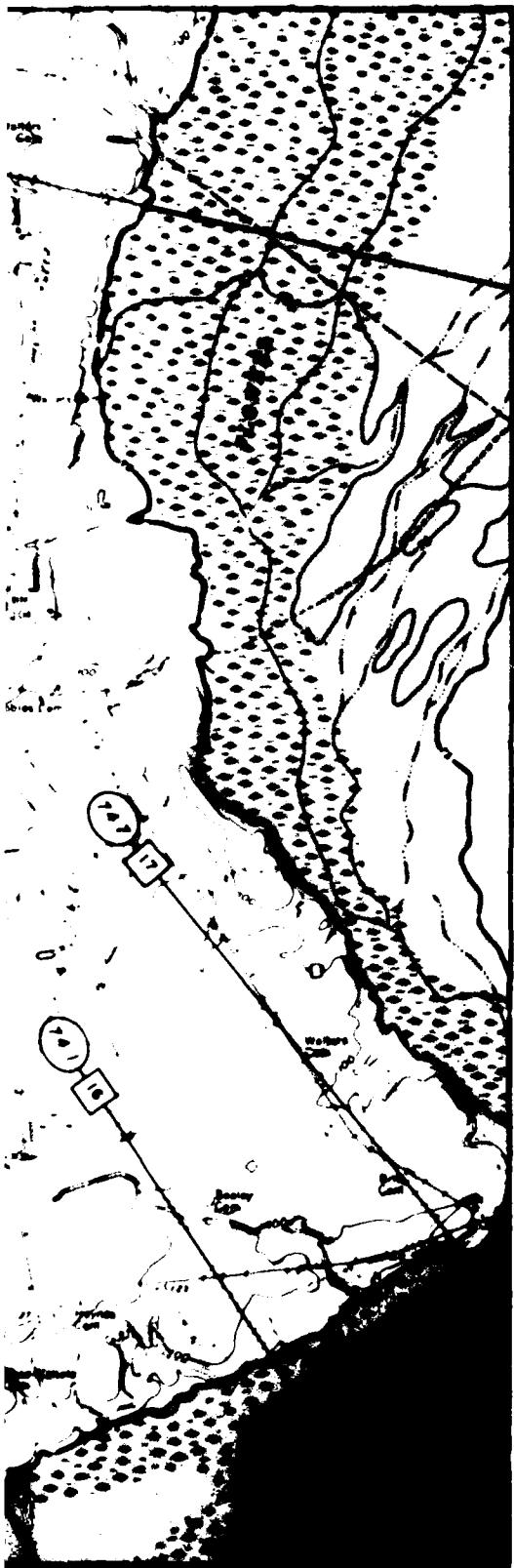
Match Line

Match Line Plate 10



Match Line Plate 7

Match Line Plate 11



Match Line Plate 11

- LEGEND -

100-YEAR FLOOD

FLOODWAY BOUNDARY

M+2 RIVER MILES

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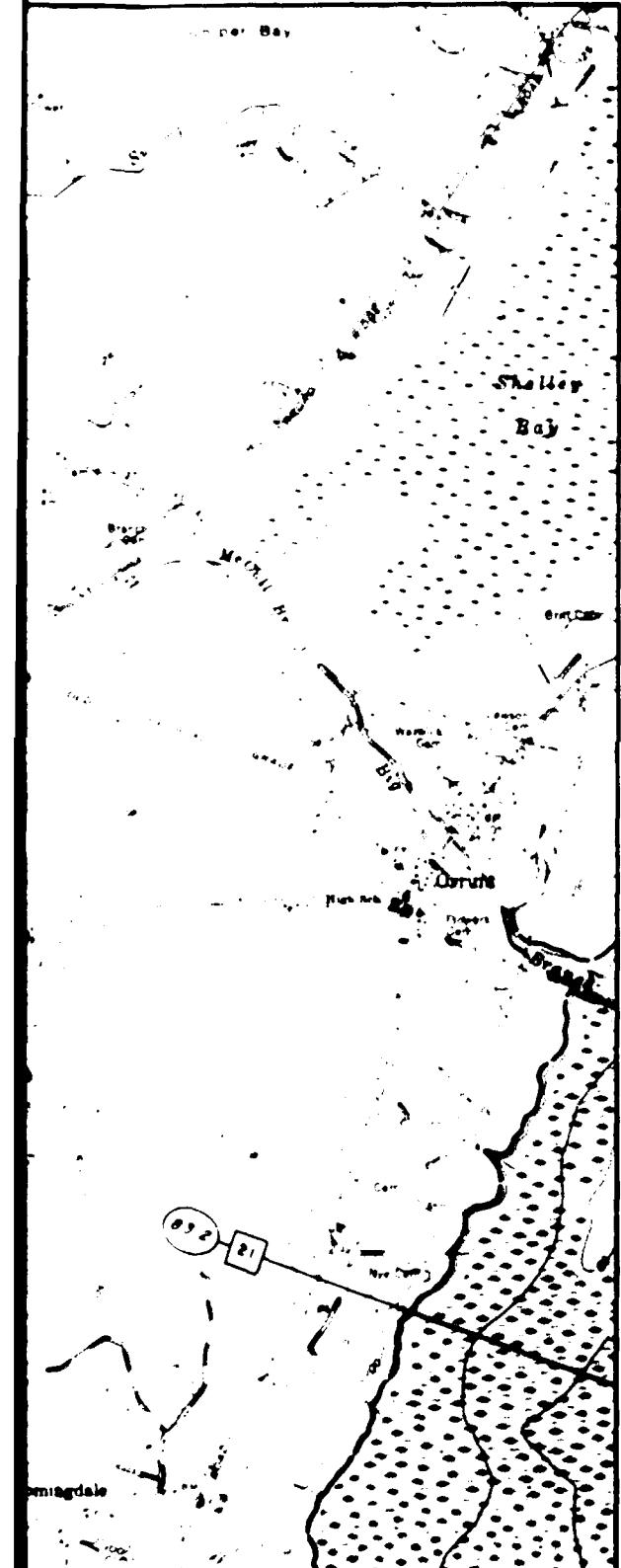
FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAPS

MARCH 1978

PLATE 11



Match Line P



— LEGEND —

100-YEAR FLOOD
 FLOODWAY BOUNDARY
M+2 RIVER MILES
 55.4 FLOOD PROTECTION ELEVATION
 IN FEET ABOVE MEAN SEA
 LEVEL
 5 CROSS SECTION

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- 3 AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
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- 5 WHERE FLOODWAY BOUNDARIES MERGE WITH 100 YEAR FLOOD LIMITS, THE 100 YEAR FLOOD LIMIT BECOMES THE FLOODWAY BOUNDARY
- 6 CONTOUR INTERVAL IS 5 FEET



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FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAPS

MARCH 1978

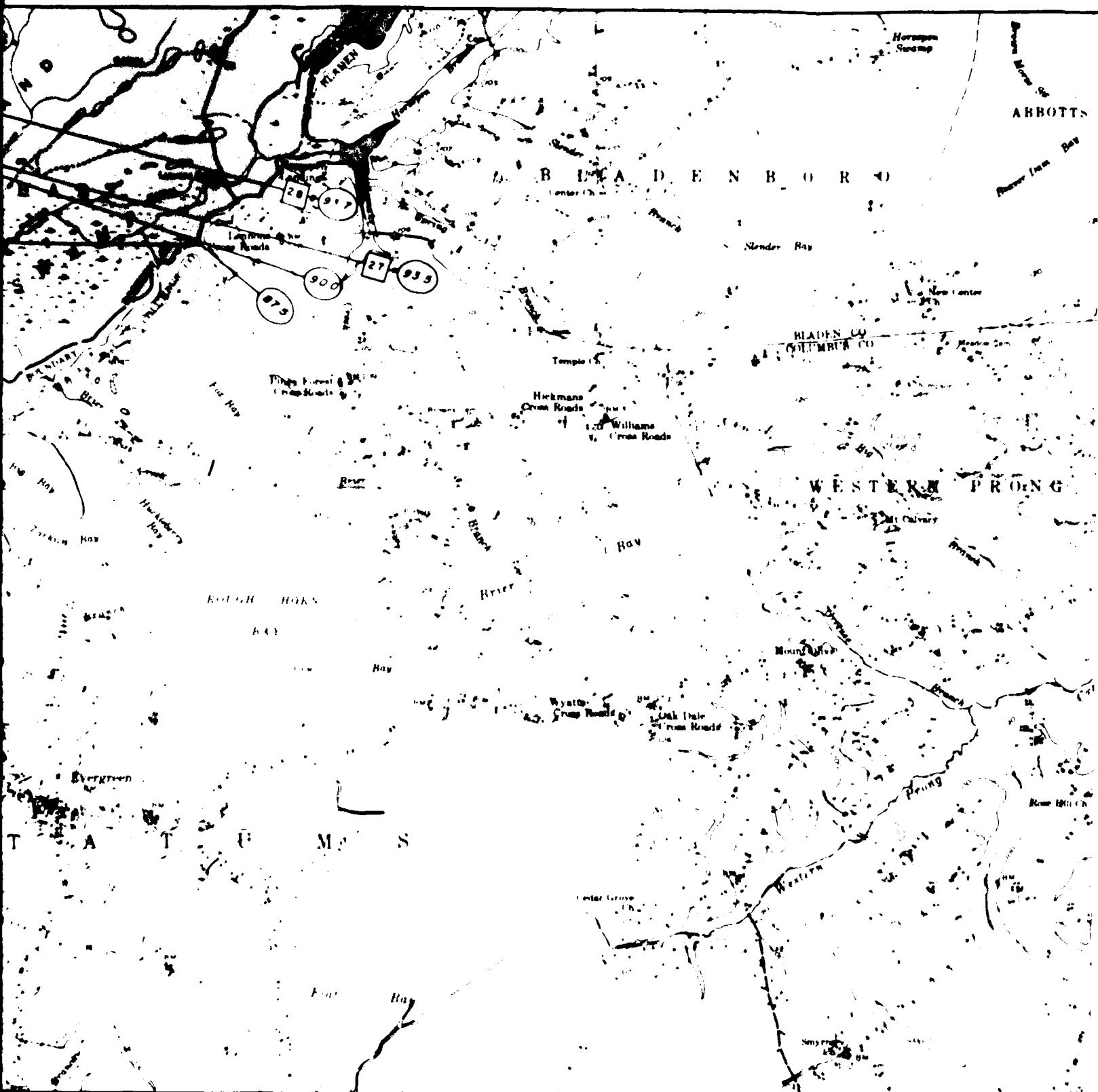
PLATE 10

Match Line Plate 9
Match Line Plate 10

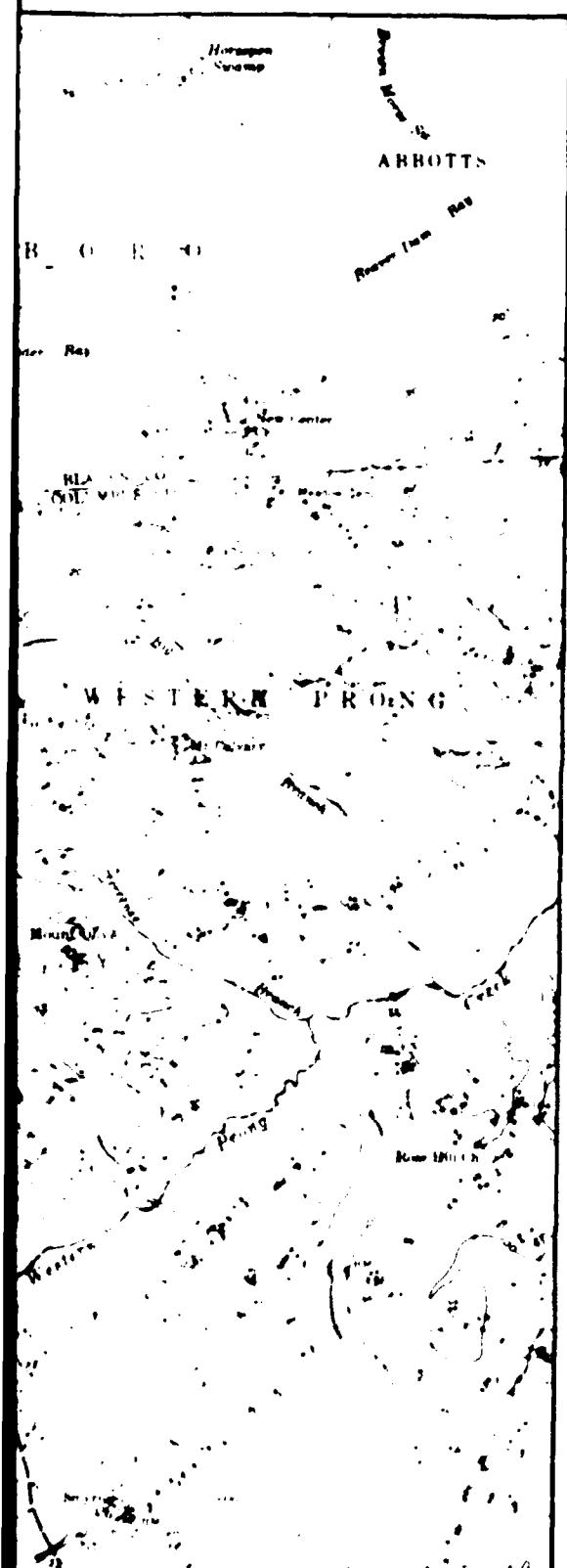
Match

Match L

Match Line Plate 12



Match Line Plate 8



- LEGEND -

100-YEAR FLOOD

FLOODWAY BOUNDARY

M+2 RIVER MILES

55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL

5 CROSS SECTION

- NOTES -

- 1 BASE MAP FURNISHED BY U S GEOLOGICAL SURVEY, WASHINGTON, D C
- 2 LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT
- 3 AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF
- 4 FLOODWAY BOUNDARIES APPLY TO LUMBER RIVER ONLY FLOODWAY LIMITS WERE NOT DETERMINED FOR TRIBUTARIES
- 5 WHERE FLOODWAY BOUNDARIES MERGE WITH 100 YEAR FLOOD LIMITS, THE 100 YEAR FLOOD LIMIT BECOMES THE FLOODWAY BOUNDARY
- 6 CONTOUR INTERVAL IS 10 FEET



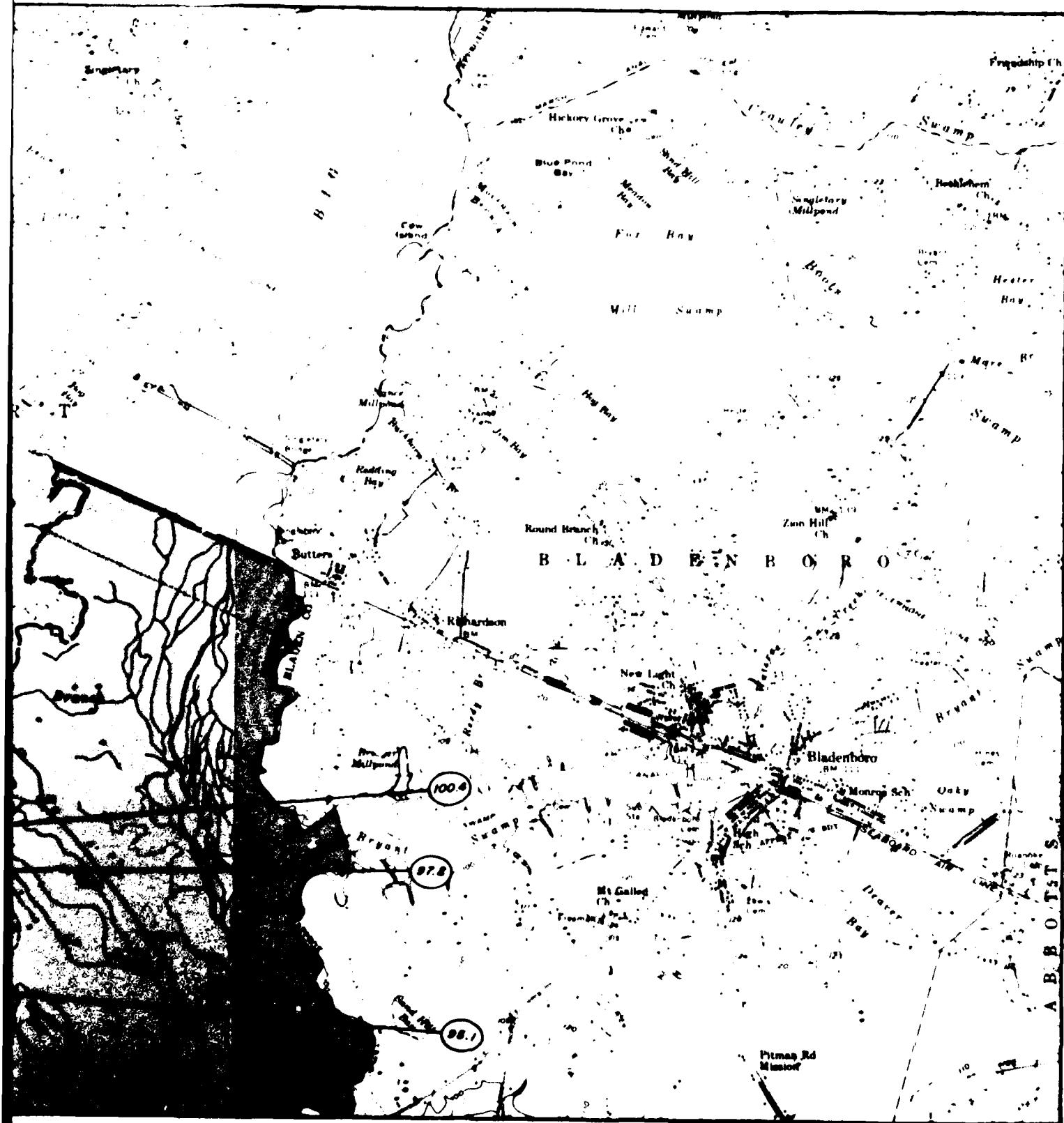
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FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.
FLOOD BOUNDARY & FLOODWAY MAPS

MARCH 1978

PLATE 11





Match Line Plate 11



- LEGEND -

- 100-YEAR FLOOD**
- FLOODWAY BOUNDARY**
- M+2 RIVER MILES**
- 55.4 FLOOD PROTECTION ELEVATION
IN FEET ABOVE MEAN SEA
LEVEL**
- CROSS SECTION**

- NOTES -

- 1 BASE MAP FURNISHED BY U S GEOLOGICAL SURVEY, WASHINGTON, D C
- 2 LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT
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- 5 WHERE FLOODWAY BOUNDARIES MERGE WITH 100 YEAR FLOOD LIMITS, THE 100 YEAR FLOOD LIMIT BECOMES THE FLOODWAY BOUNDARY
- 6 CONTOUR INTERVAL IS 10 FEET

5000 0 5000 10000 15000

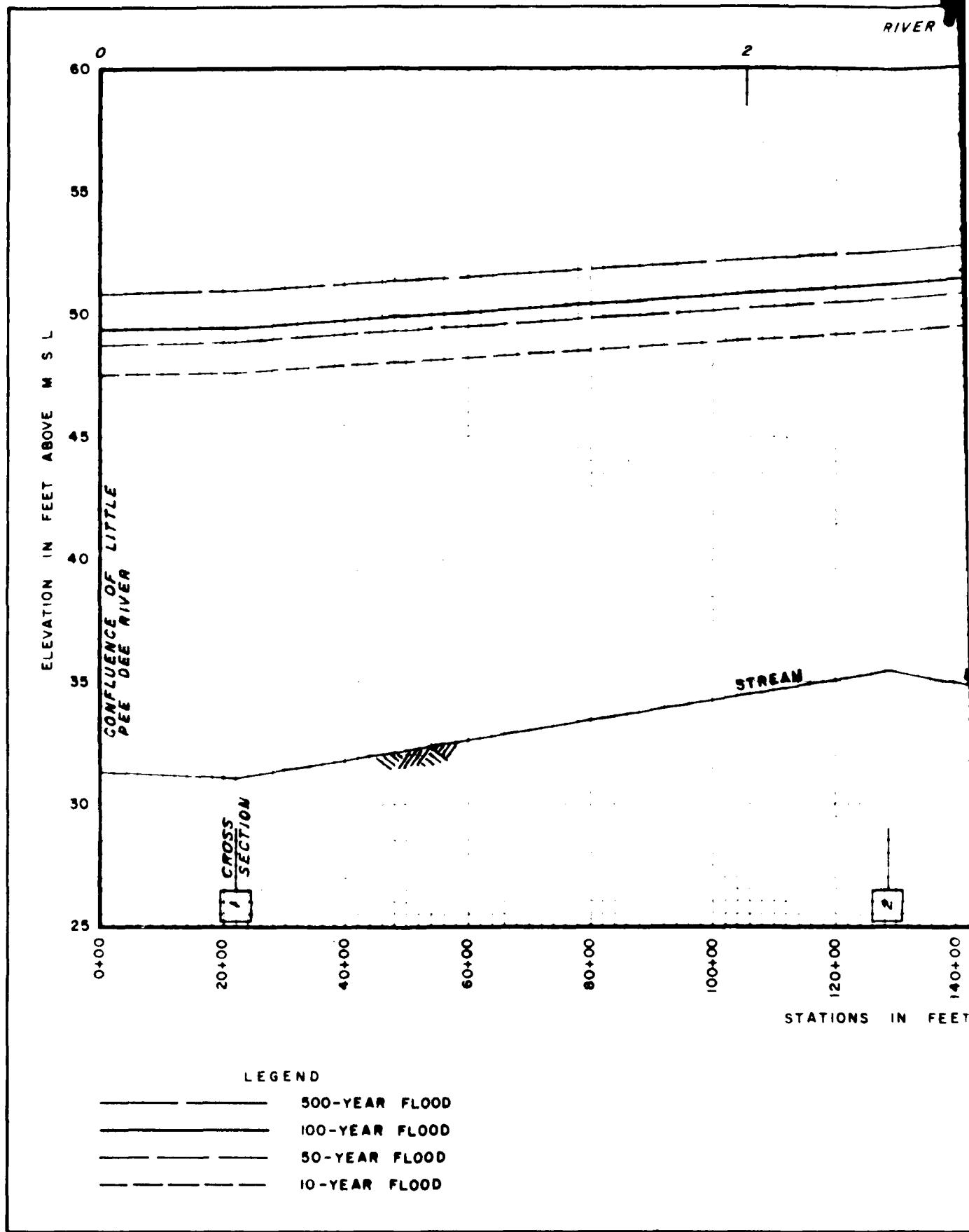
SCALE IN FEET

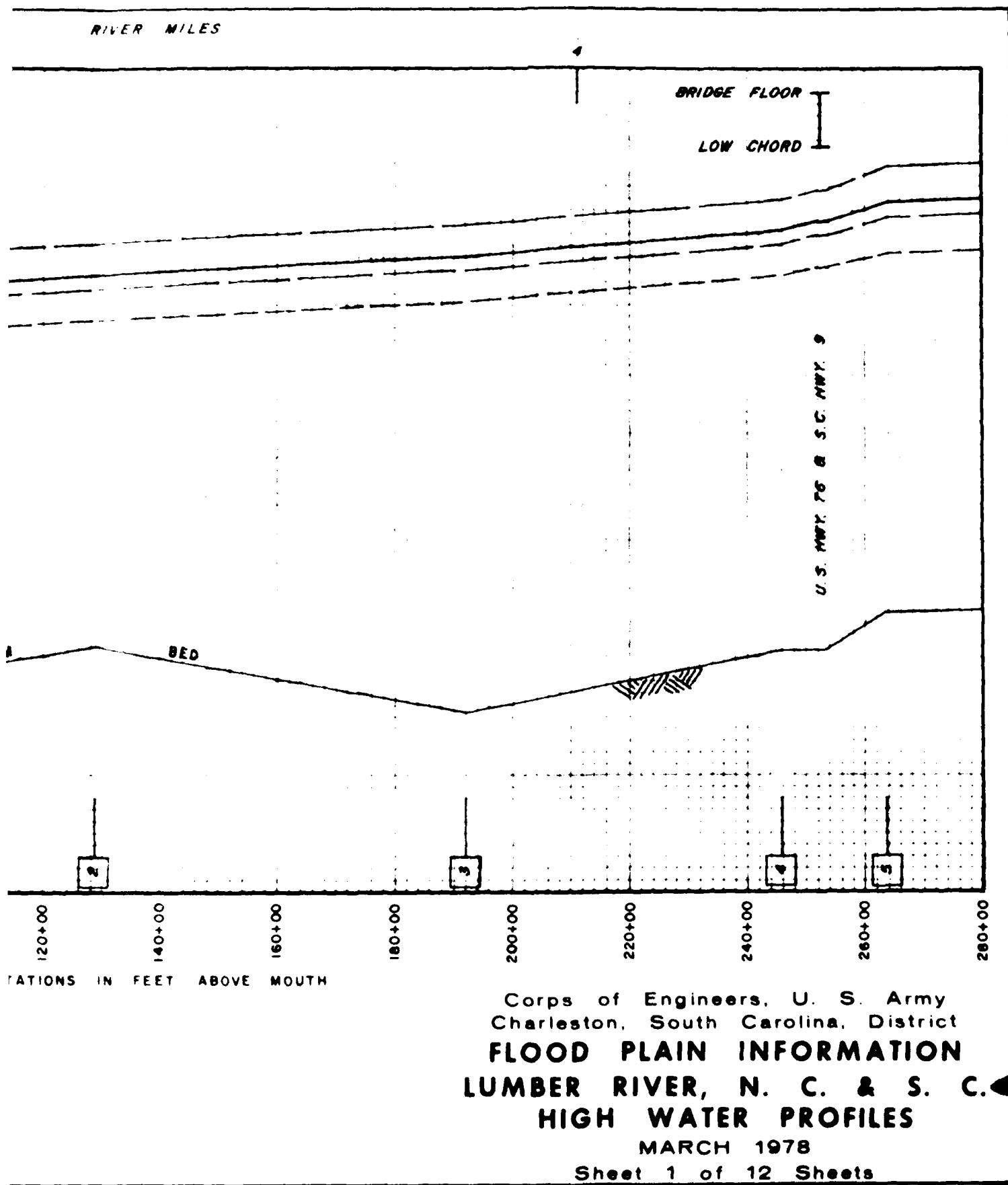
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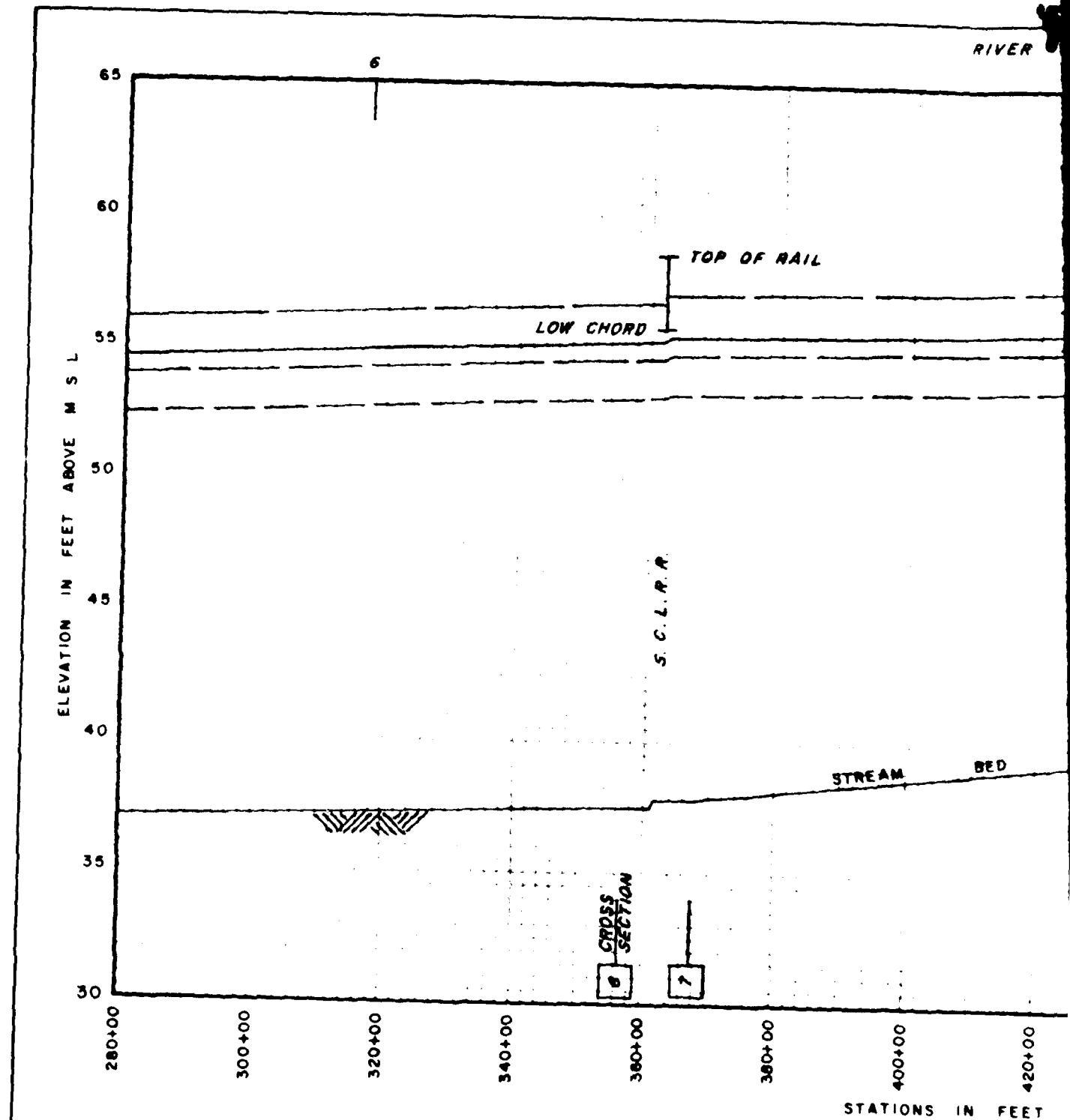
FLOOD PLAIN INFORMATION
LUMBER RIVER, N. C. & S. C.

FLOOD BOUNDARY & FLOODWAY MAPS

MARCH 1978







LEGEND

— — — — — 500-YEAR FLOOD
— — — — — 100-YEAR FLOOD
— — — — — 50-YEAR FLOOD
— — — — — 10-YEAR FLOOD

RIVER MILES

8

10

CONfluence of
SHEARWATER

EAM BED

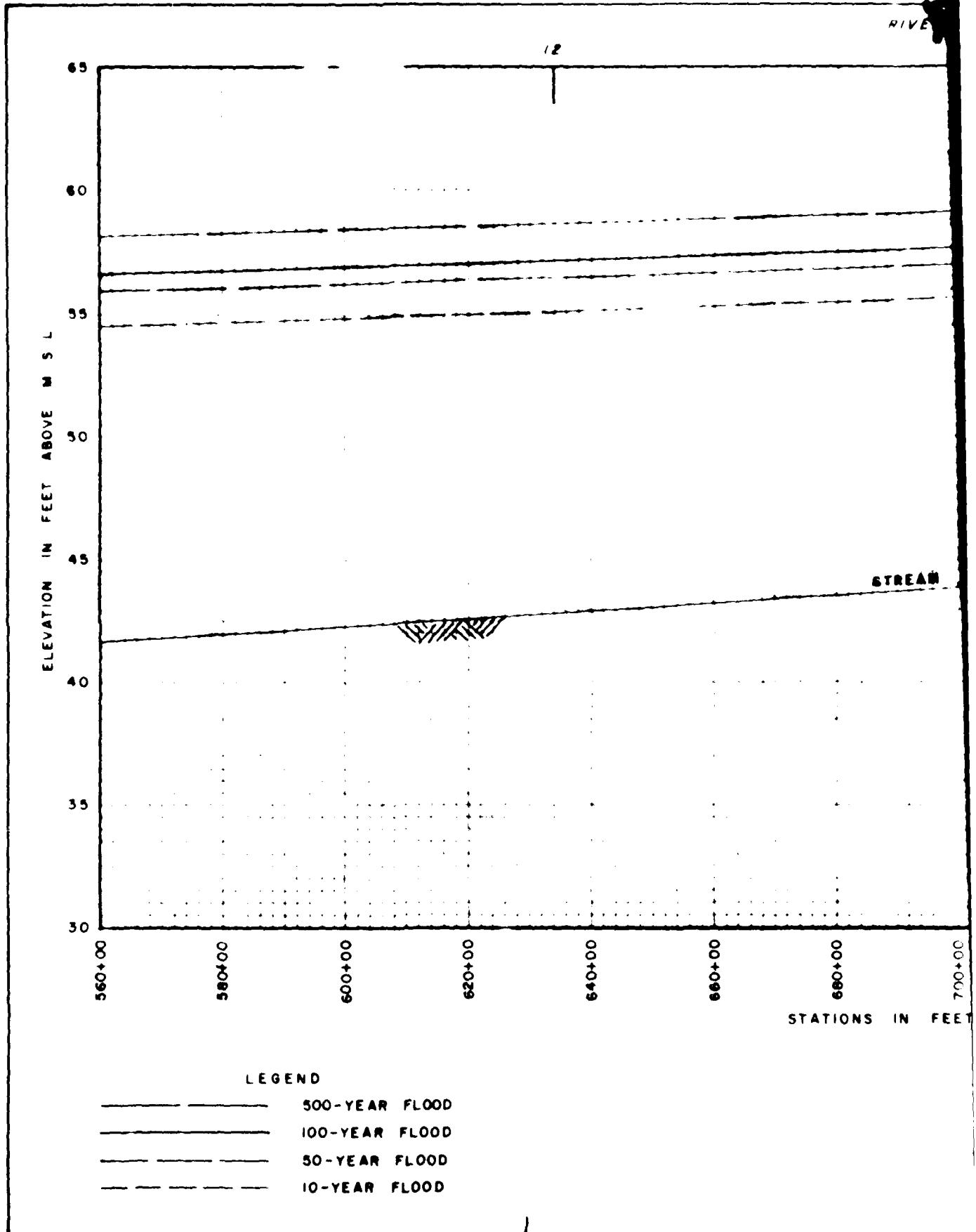
4000+00 420+00 40+00 00 480+00 490+00 500+00 520+00 540+00 560+00
ELEVATIONS IN FEET ABOVE MOUTH

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PLATE 14

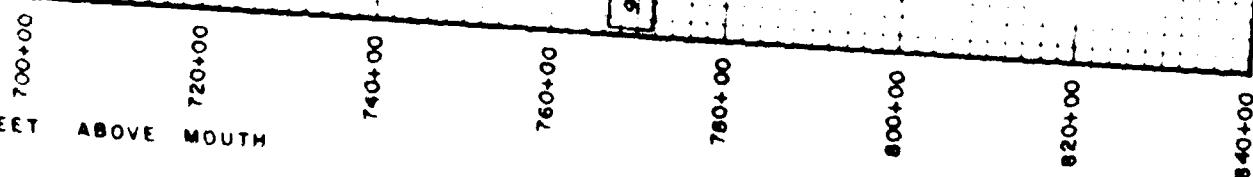


RIVER MILES

14

STREAM BED

CROSS SECTION
9



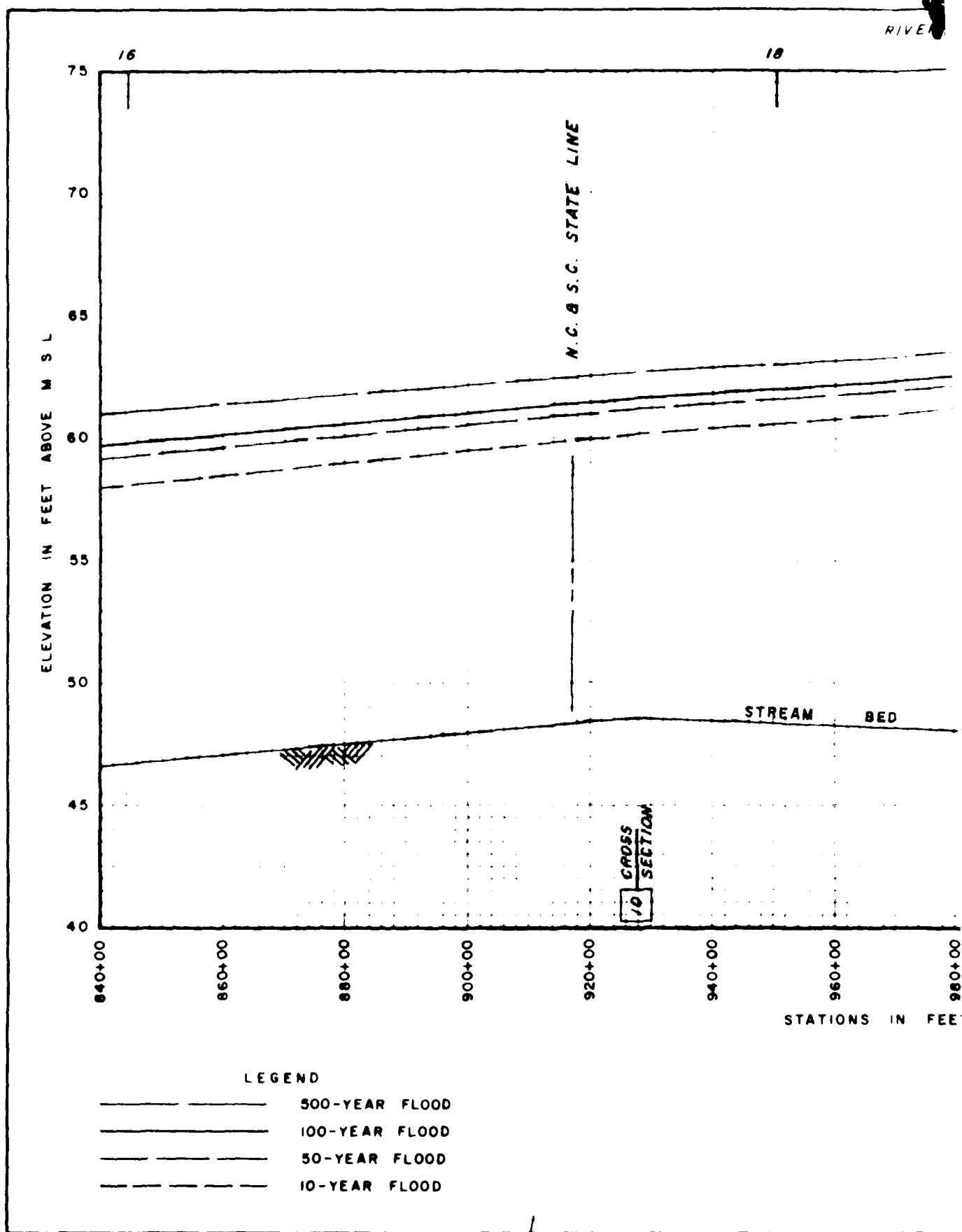
Elevations in feet above mouth

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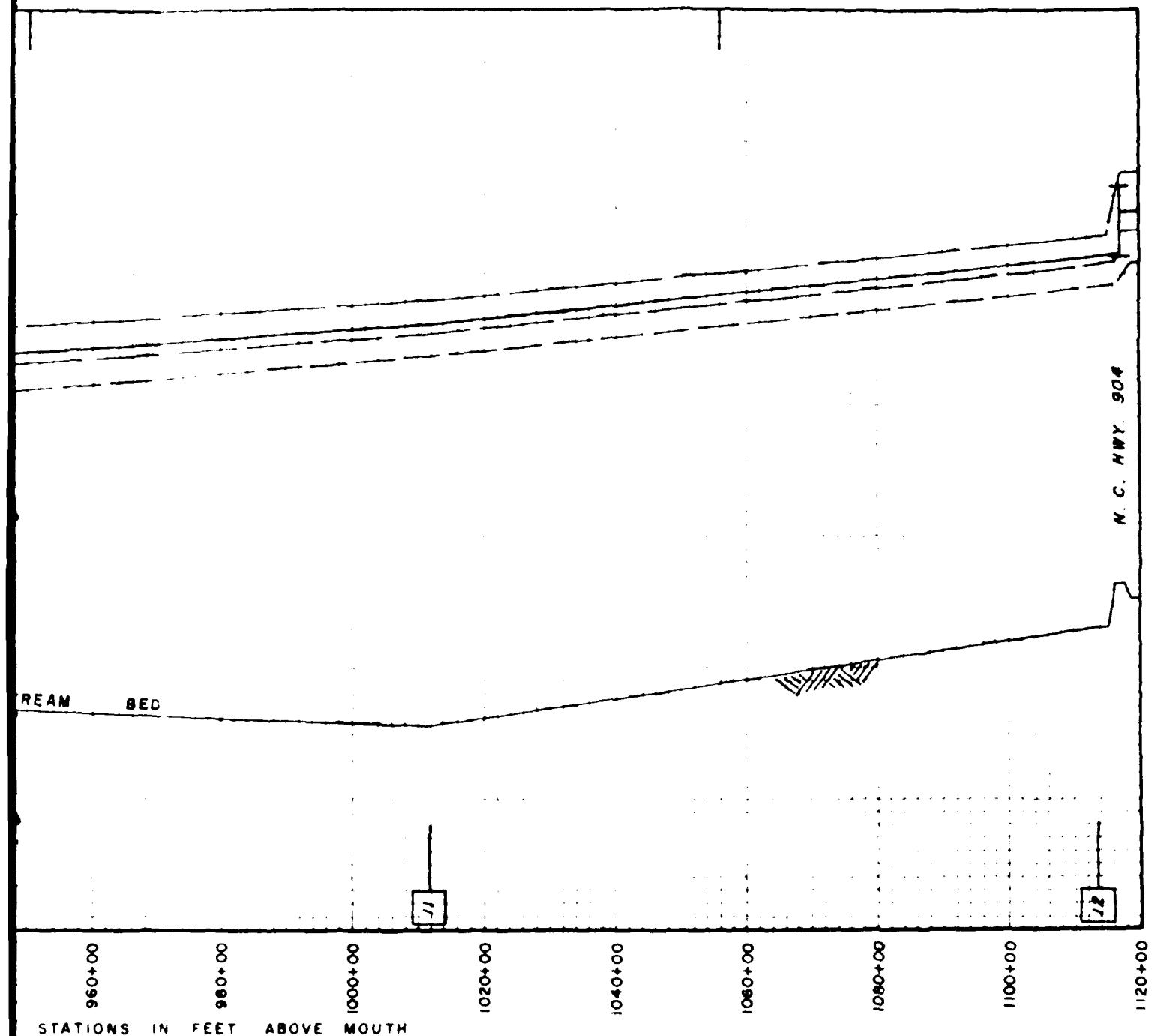
PLATE 10



RIVER MILES

20

18



STATIONS IN FEET ABOVE MOUTH

960+00

980+00

1000+00

1020+00

1040+00

1060+00

1080+00

1100+00

1120+00

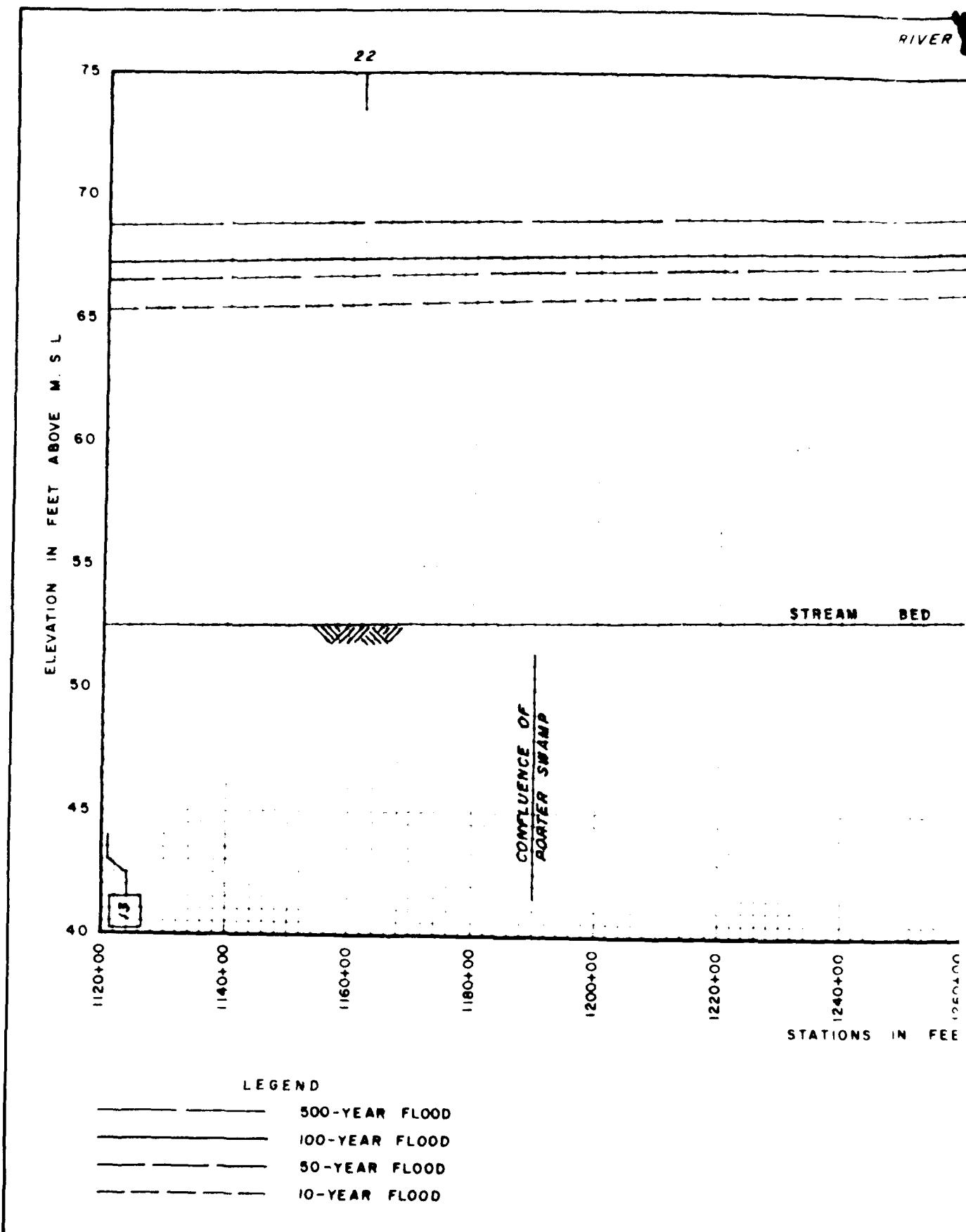
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PLATE 16



RIVER MILES

24

26

STREAM BED

CROSS SECTION

1240+00

1260+00

1280+00

1300+00

1320+00

1340+00

1360+00

1380+00

1400+00

STATIONS IN FEET ABOVE MOUTH

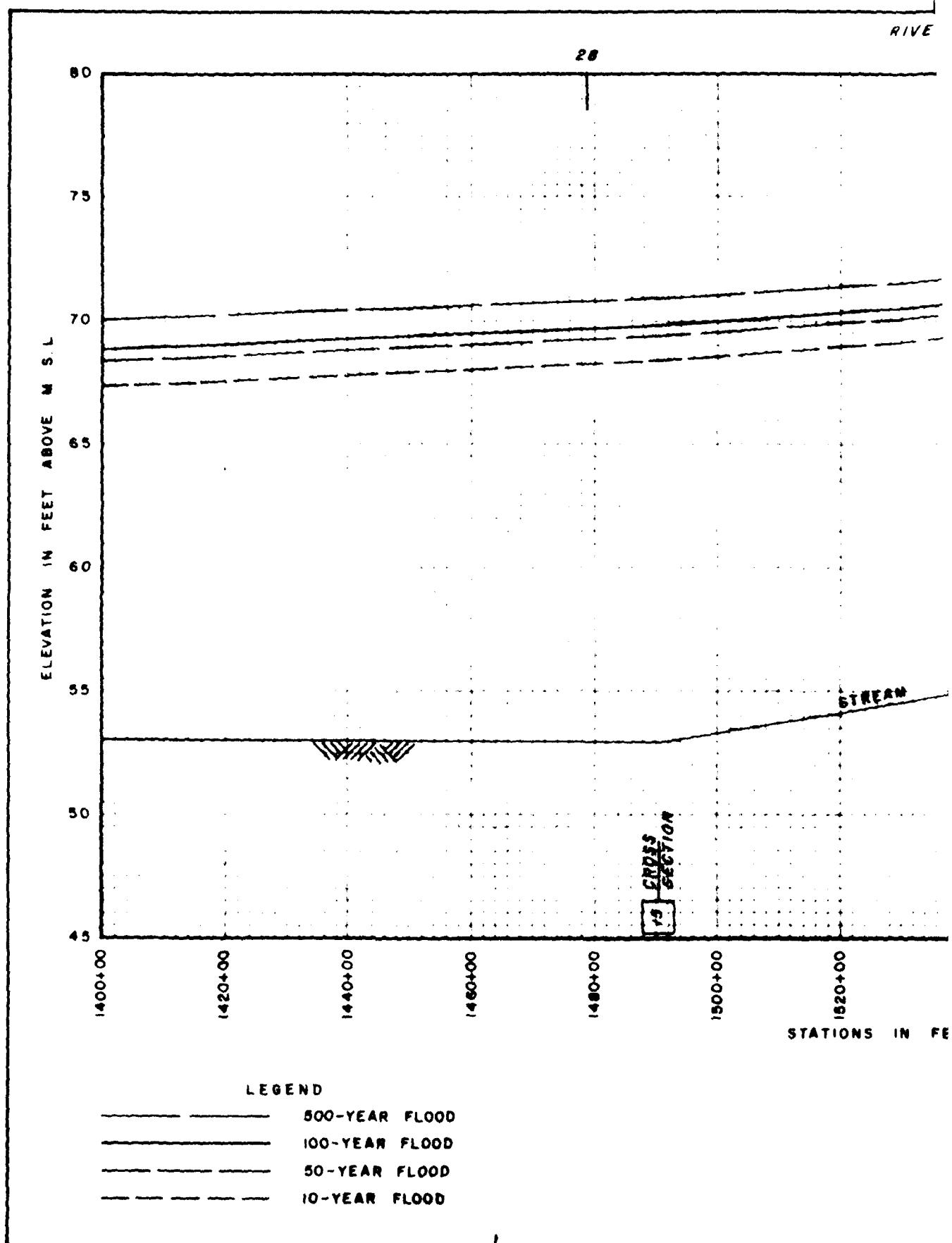
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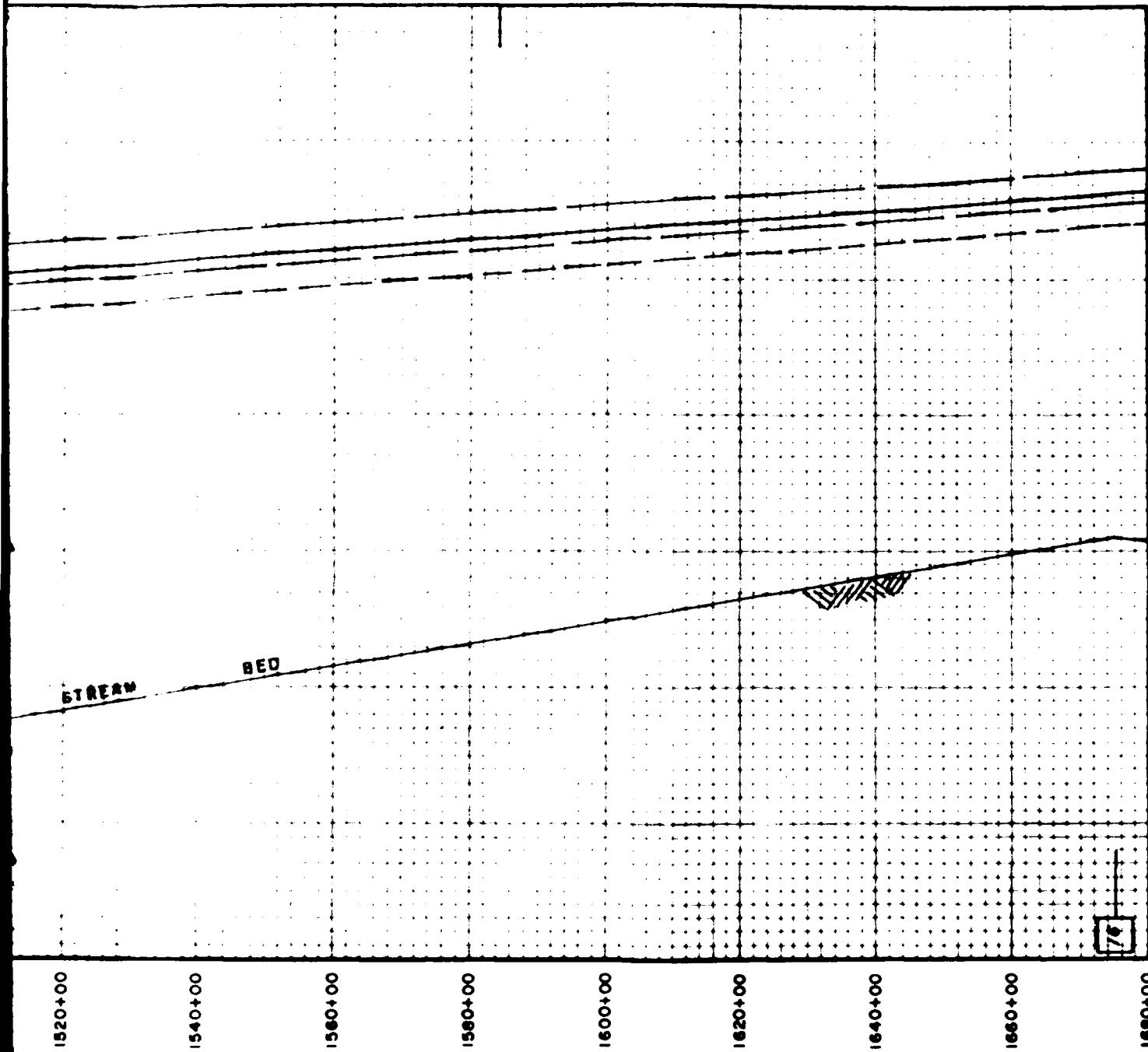
Sheet 5 of 12 Sheets

PLA



RIVER MILES

30



1520+00 1540+00 1560+00 1580+00 1600+00 1620+00 1640+00 1660+00 1680+00
ELEVATIONS IN FEET ABOVE MOUTH

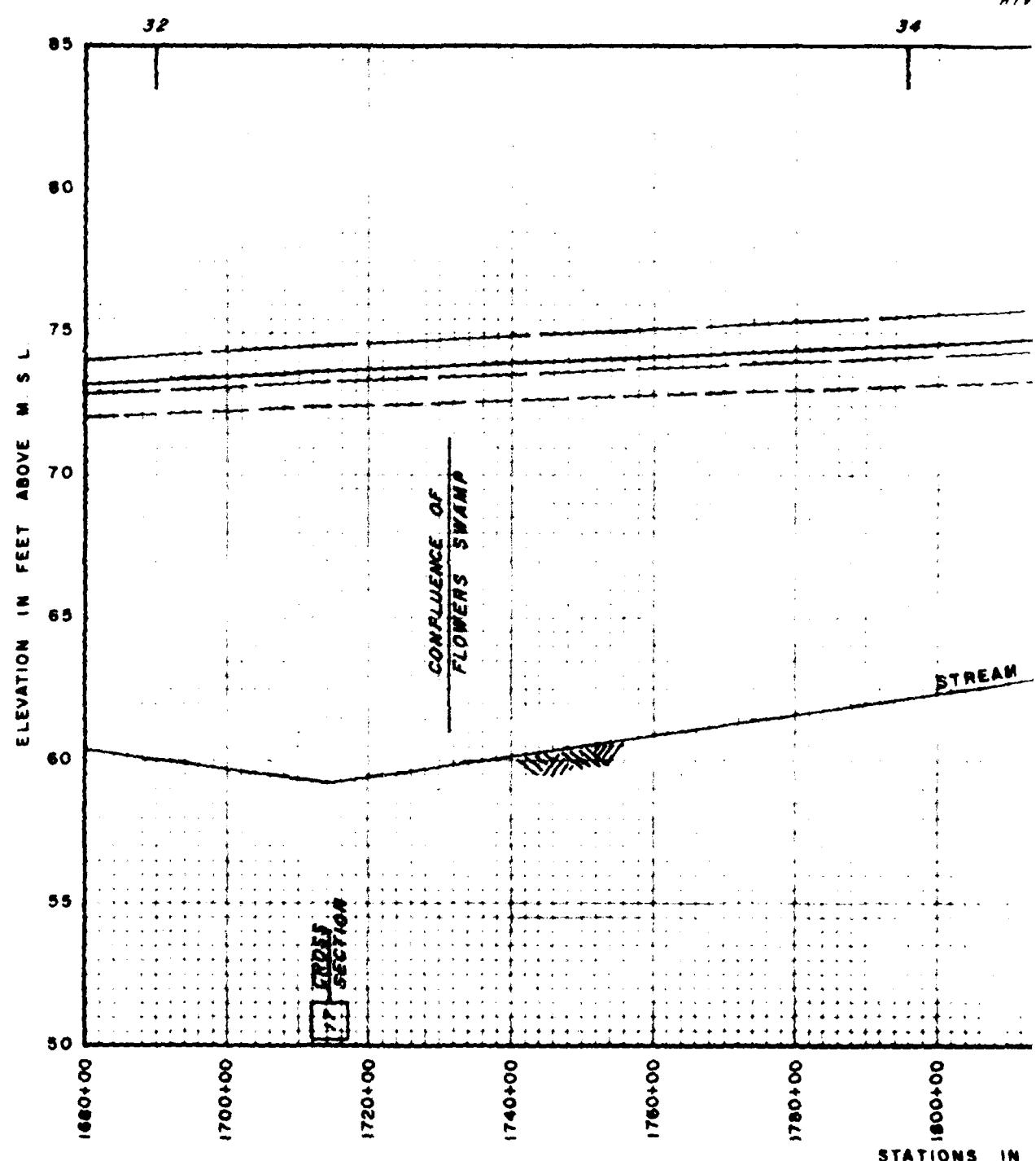
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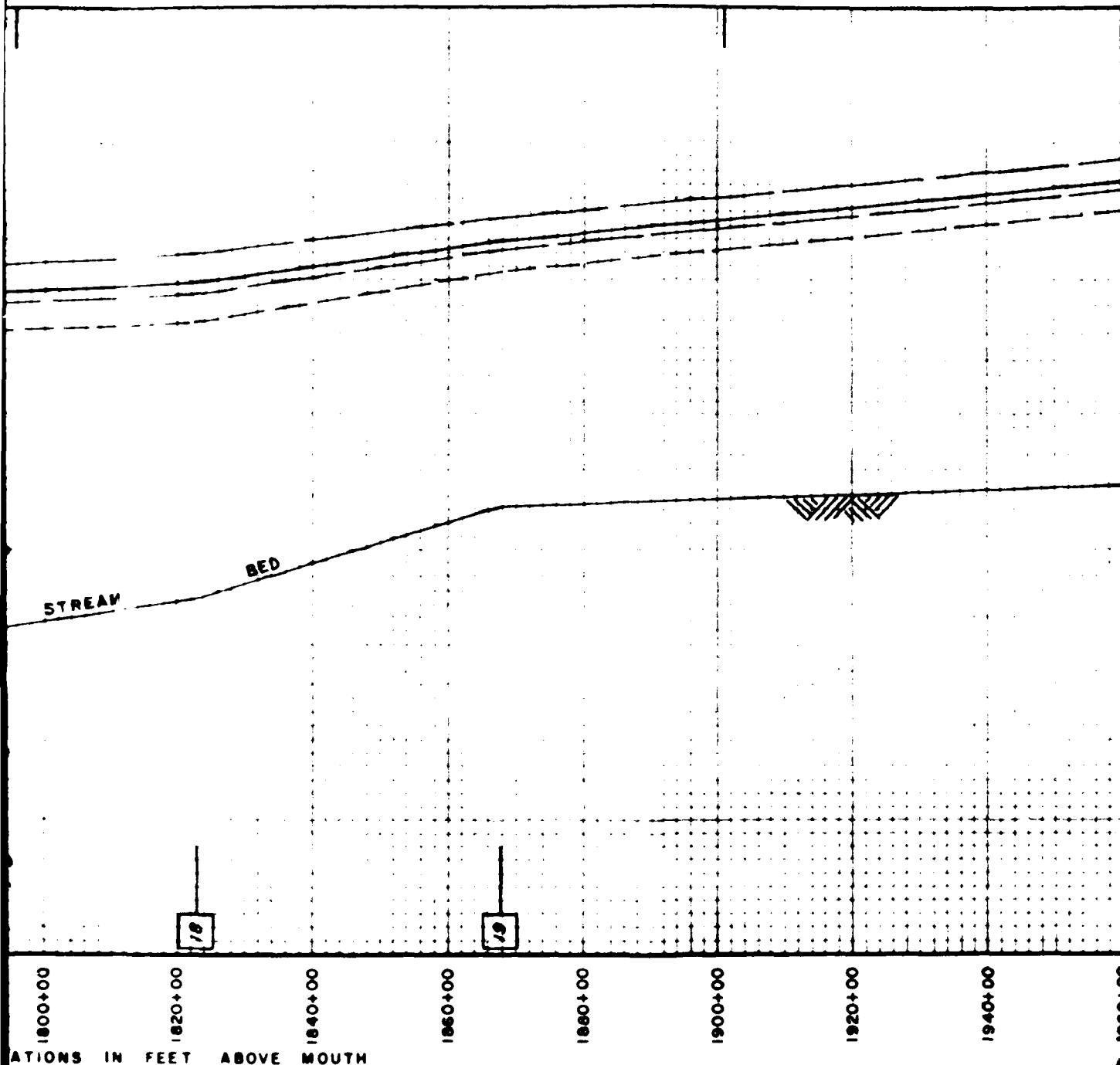
PC



RIVER MILES

34

36



POSITIONS IN FEET ABOVE MOUTH

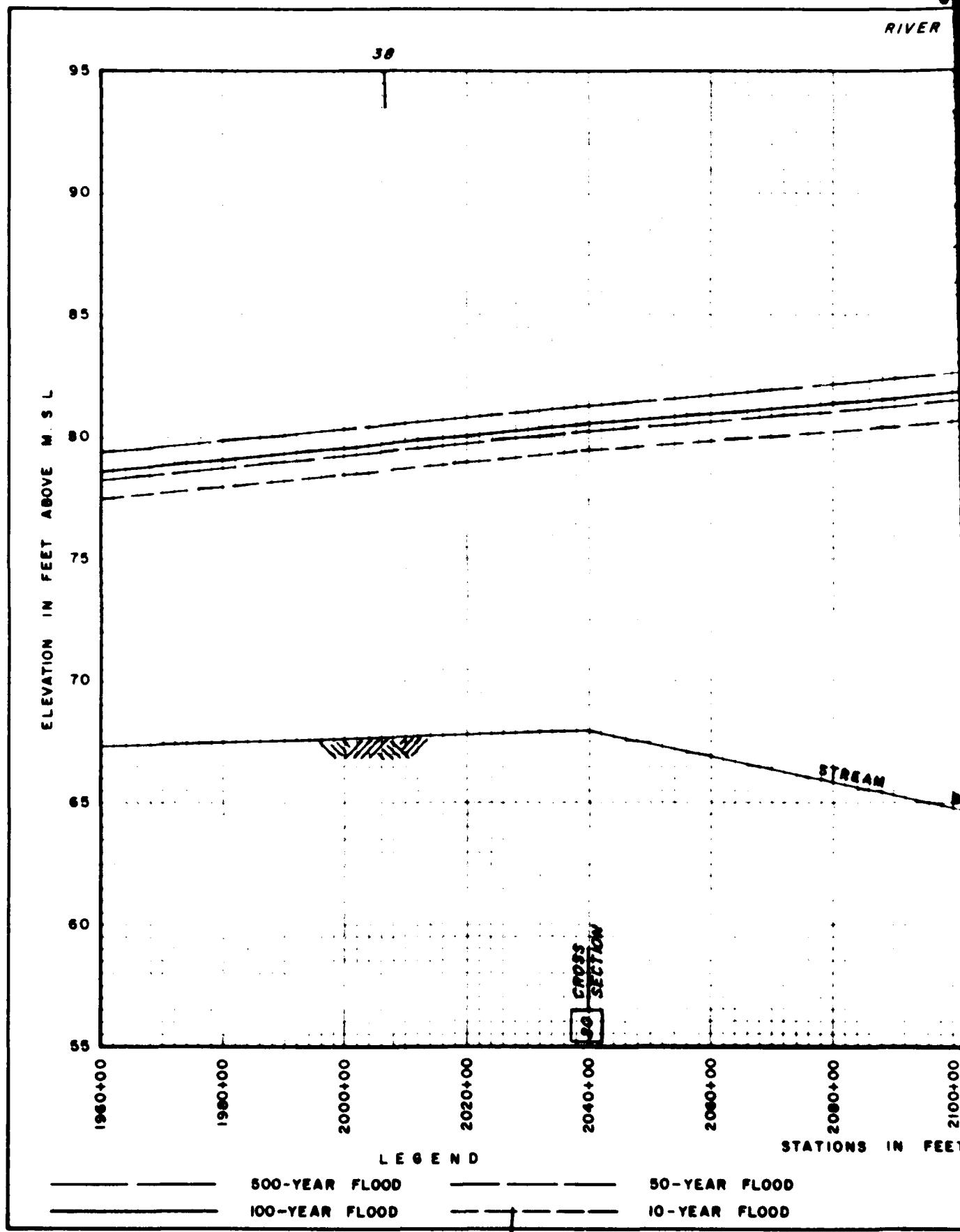
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2



RIVER MILES

40

42

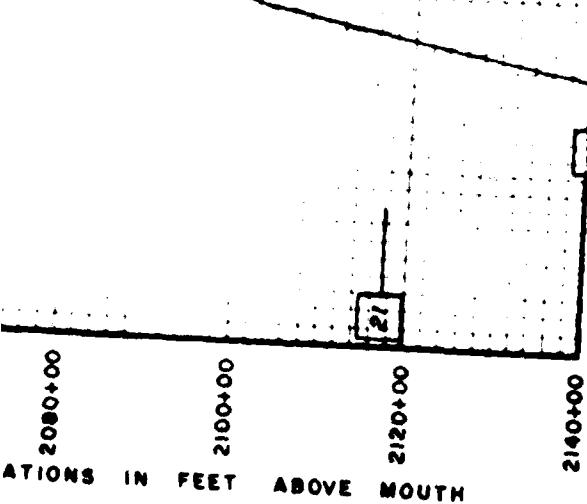
BRIDGE FLOOR

LOW CHORD

SECTION 6000
#2-7308
U.S. HIGH. 70 & N.C. HIGH. 130

STREAM

BED

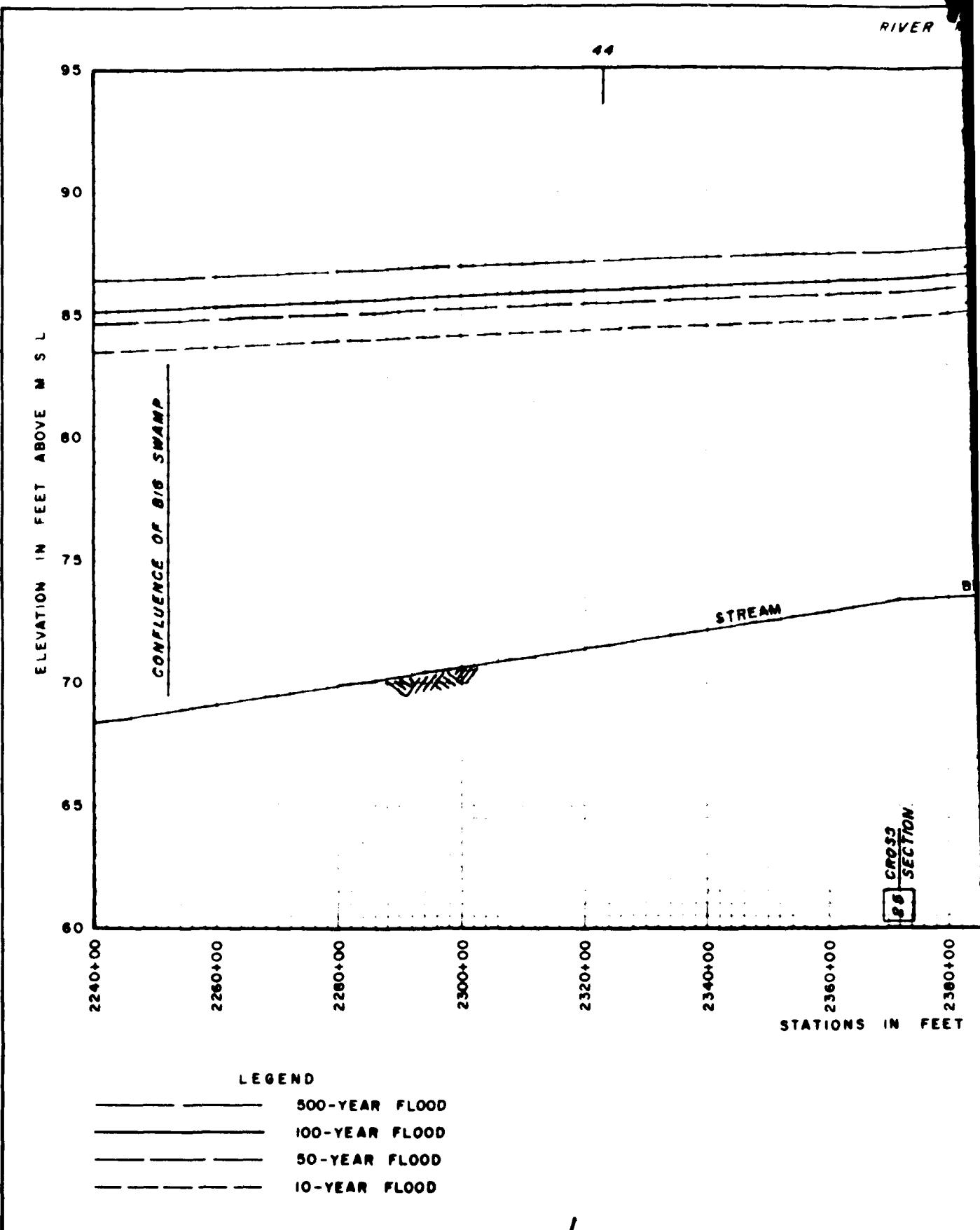


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RIVER MILES

46

BED

25
CROSS
SECTION

2360+00 2380+00 2400+00 2420+00 2440+00 2460+00 2480+00 2500+00 2520+00
ATIONS IN FEET ABOVE MOUTH

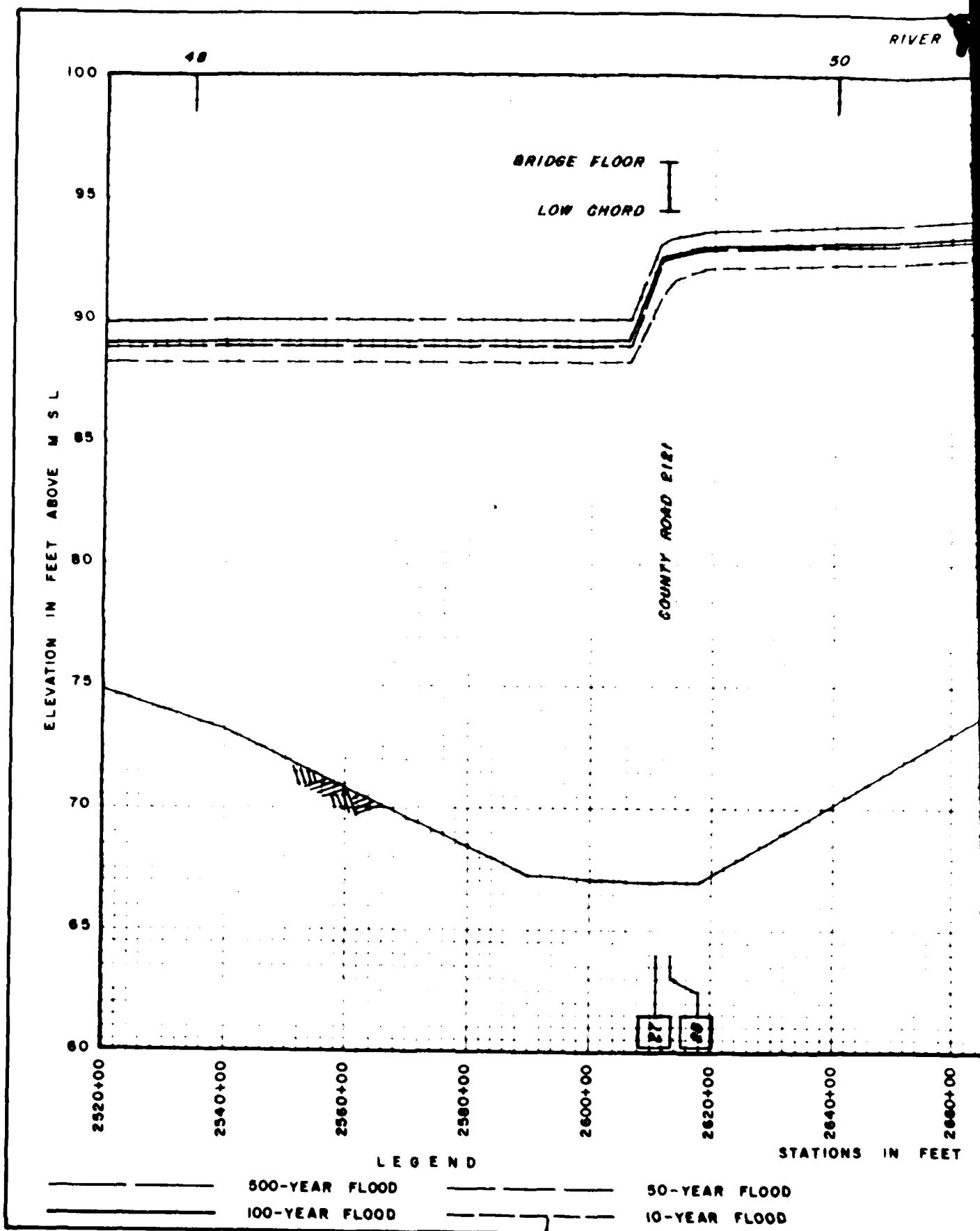
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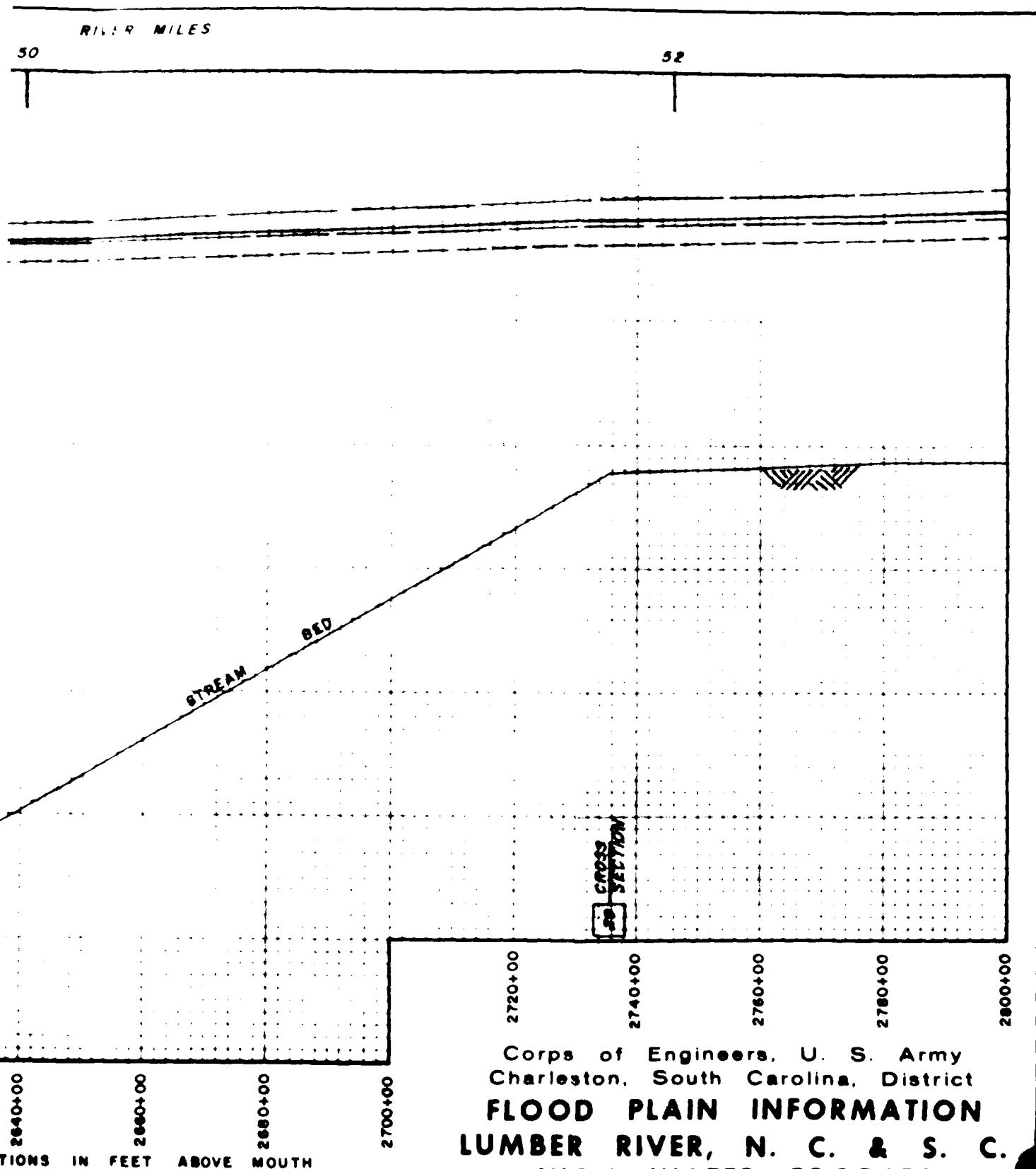
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PLATE





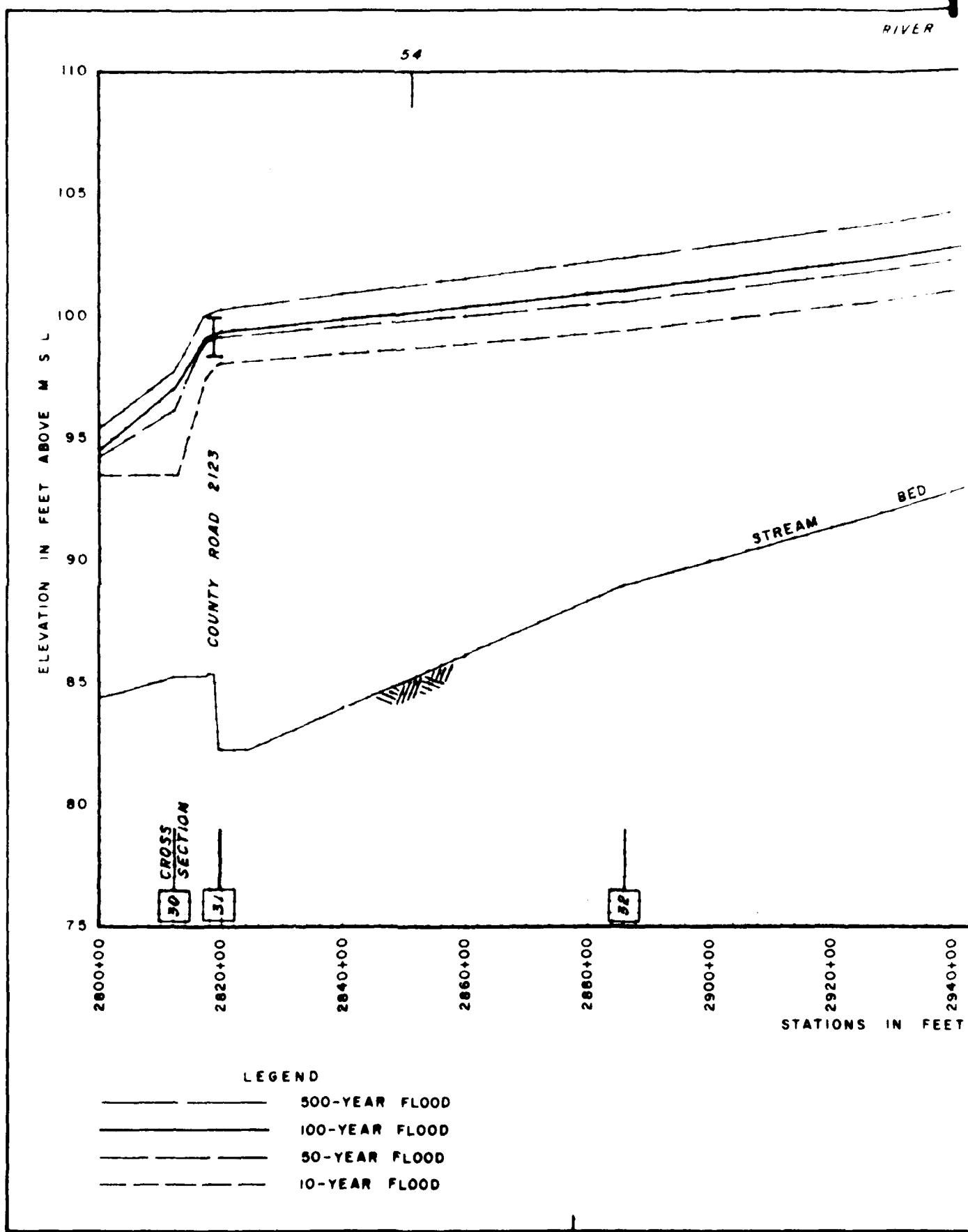
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RIVER MILES

56

58

BLDG

TEAM

CONFLUENCE OF JACOB SWAMP

59

2920+00

2940+00

2960+00

2980+00

3000+00

3020+00

3040+00

3060+00

3080+00

STATIONS IN FEET ABOVE MOUTH

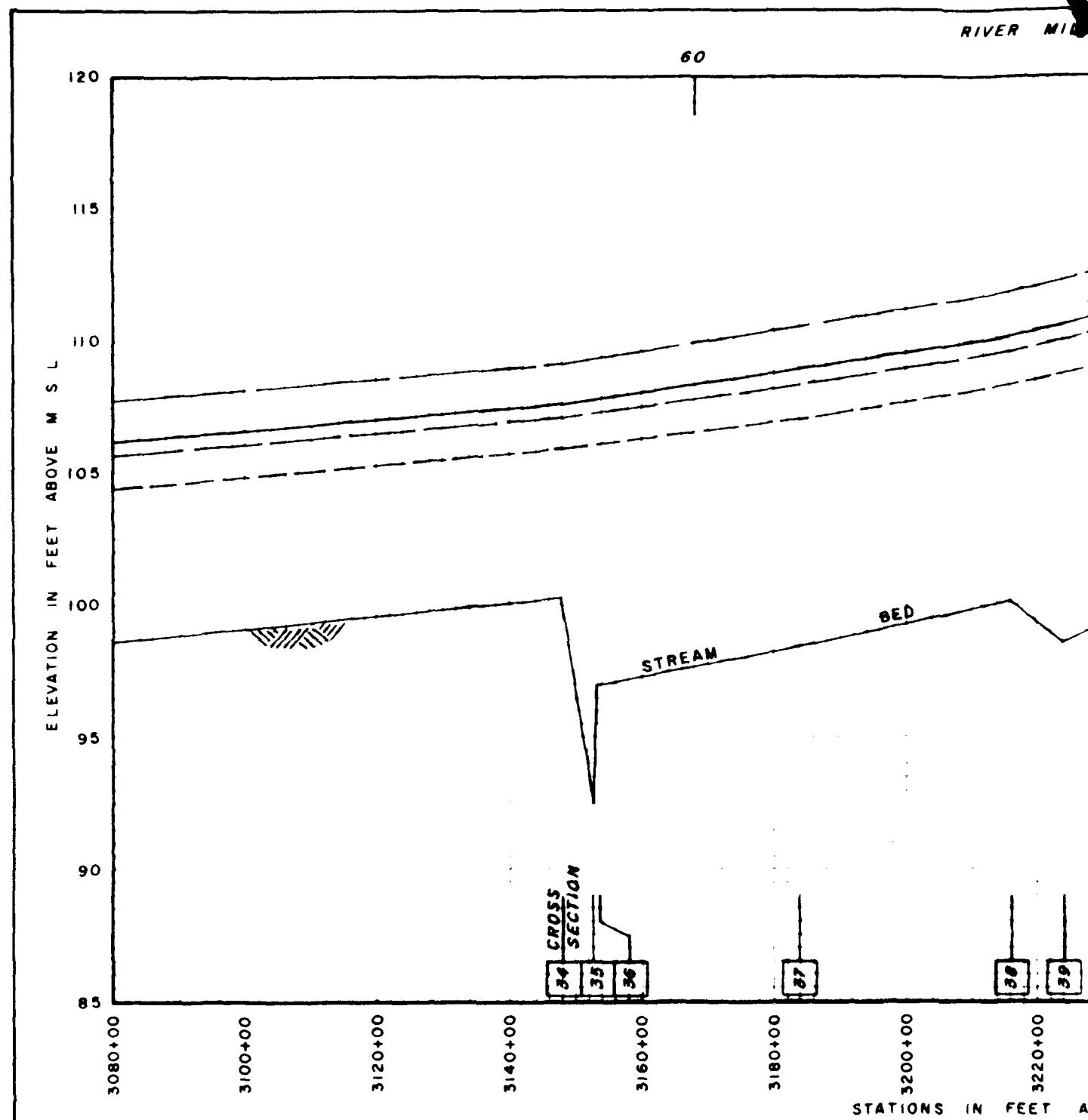
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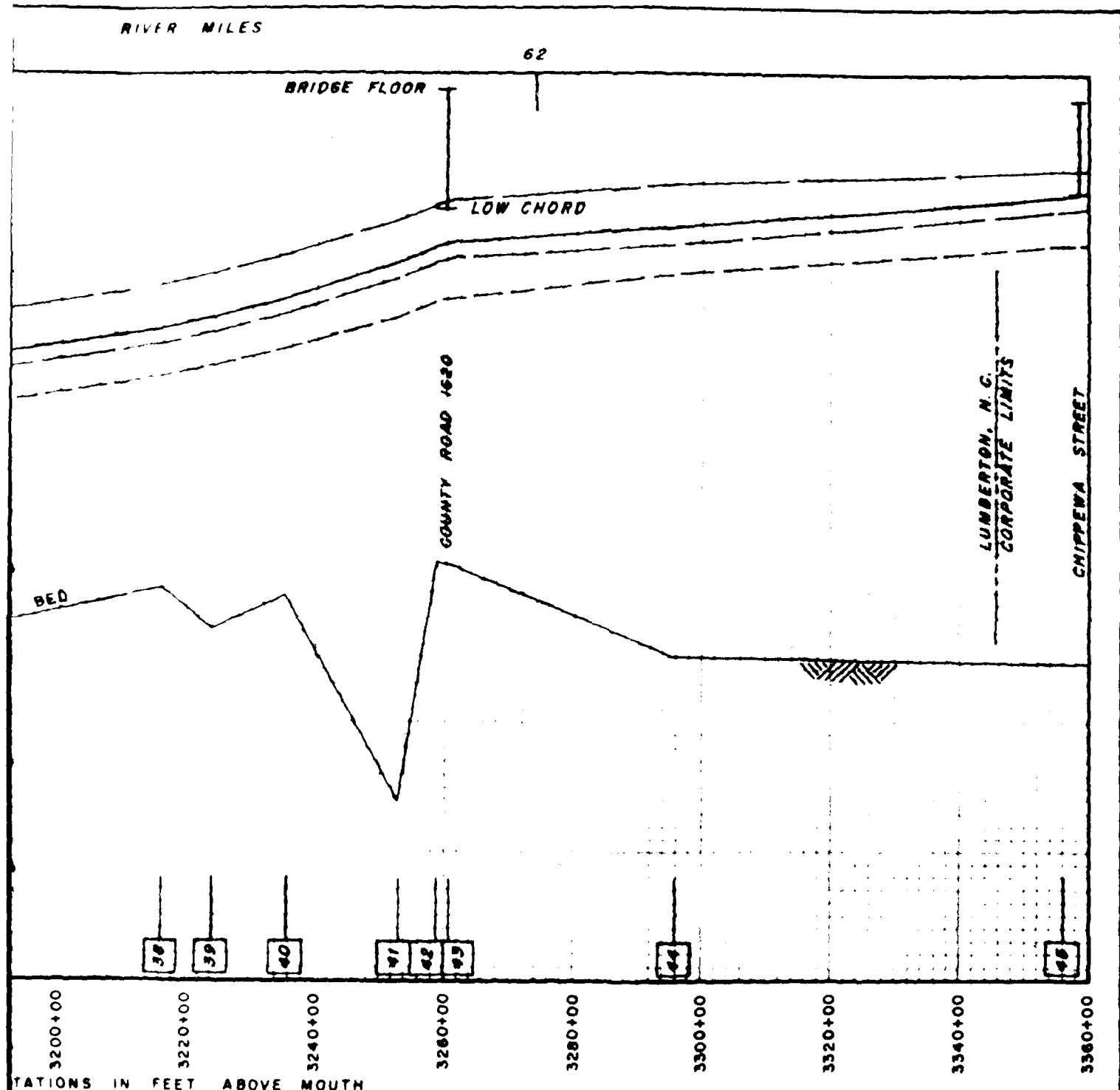
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PLATE 23



LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD



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PLATE

ND